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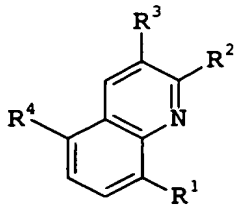
Cyclohexenonequinolinoyl derivatives

The present invention relates to novel cyclohexenonequinolinoyl derivatives of the formula I,



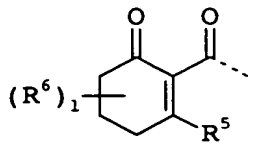
I

where:

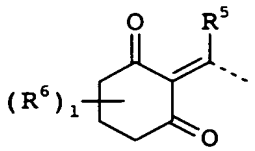
R^1 is hydrogen, nitro, halogen, cyano, C_1–C_6–alkyl, C_1–C_6–haloalkyl, C_1-C_6-alkoxyiminomethyl, C_1–C_6–alkoxy, C_1–C_6–haloalkoxy, C_1–C_6–alkylthio, C_1–C_6–haloalkylthio, C_1–C_6–alkylsulfinyl, C_1–C_6–haloalkylsulfinyl, C_1–C_6–alkylsulfonyl, C_1–C_6–haloalkylsulfonyl, aminosulfonyl, N–(C_1–C_6–alkyl)aminosulfonyl, N,N–di–(C_1–C_6–alkyl)aminosulfonyl, N–(C_1–C_6–alkylsulfonyl)amino, N–(C_1–C_6–haloalkylsulfonyl)amino, N–(C_1–C_6–alkyl)–N–(C_1–C_6–alkylsulfonyl)amino, N–(C_1–C_6–alkyl)–N–(C_1–C_6–haloalkylsulfonyl)amino, phenoxy, heterocyclyloxy, phenylthio or heterocyclylthio, where the four last-mentioned radicals may be partially or fully halogenated and/or may carry one to three of the following substituents:
nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

R^2, R^3 are hydrogen, C_1-C_6-alkyl, C_1-C_6-haloalkyl or halogen;

R^4 is a compound IIa or IIb



IIa



IIb

where

R^5 is halogen, OR^7, SR^7, SOR^8, SO_2R^8, OSO_2R^8, POR^8R^9, OPR^8R^9, $OPOR^8R^9$, $OPSR^8R^9$, $NR^{10}R^{11}$, $ONR^{11}R^{12}$, N-linked heterocyclyl or O-(N-linked heterocyclyl), where the heterocyclyl radical of the two last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:
nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

R^6 is nitro, halogen, cyano, C_1–C_6–alkyl, C_1–C_6–haloalkyl, di-(C_1-C_6-alkoxy)methyl, di-(C_1-C_6-alkylthio)methyl, (C_1-C_6-alkoxy)(C_1-C_6-alkylthio)methyl, hydroxy, C_1–C_6–alkoxy, C_1–C_6–haloalkoxy, C_1-C_6-alkoxycarbonyloxy, C_1–C_6–alkylthio, C_1–C_6–haloalkylthio, C_1–C_6–alkylsulfinyl, C_1–C_6–haloalkylsulfinyl, C_1–C_6–alkylsulfonyl,C_1–C_6–haloalkylsulfonyl, C_1–C_6–alkylcarbonyl, C_1–C_6–haloalkylcarbonyl, C_1–C_6–alkoxycarbonyl or C_1–C_6–haloalkoxycarbonyl;

or

two radicals R^6, which are linked to the same carbon, together form an $-O-(CH_2)_m-O-$, $-O-(CH_2)_m-S-$, $-S-(CH_2)_m-S-$, $-O-(CH_2)_n-$ or $-S-(CH_2)_n$ chain which may be substituted by one to three radicals from the following group:
halogen, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl or C_1-C_4-alkoxycarbonyl;

or

two radicals R^6, which are linked to the same carbon, together form a $-(CH_2)_p$ chain which may be interrupted by oxygen or sulfur and/or may be substituted by one to four radicals from the following group:
halogen, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl or C_1-C_4-alkoxycarbonyl;

or

two radicals R^6, which are linked to the same carbon, together form a methylidene group which may be substituted by one or two radicals from the following group:
halogen, hydroxyl, formyl, cyano, C_1–C_6–alkyl, C_1–C_6–haloalkyl, C_1–C_6–alkoxy, C_1–C_6–haloalkoxy, C_1–C_6–alkylthio, C_1–C_6–haloalkylthio, C_1–C_6–alkylsulfinyl, C_1–C_6-haloalkylsulfinyl, C_1–C_6–alkylsulfonyl or C_1–C_6–haloalkylsulfonyl;

or

two radicals R^6, which are linked to the same carbon, together with this carbon form a carbonyl group;

or

two radicals R^6, which are linked to different carbons, together form a $-(CH_2)_n$ chain which may be substituted by one to three radicals from the following group:
halogen, C_1-C_6-alkyl, C_1-C_6-alkoxy, hydroxyl or C_1-C_6-alkoxycarbonyl;

R^7 is C_1–C_6–alkyl, C_3–C_6–alkenyl, C_3–C_6–haloalkenyl, C_3–C_6–alkynyl, C_3–C_6–haloalkynyl, C_3–C_6–cycloalkyl, C_1–C_{20}–alkylcarbonyl, C_2–C_6–alkenylcarbonyl, C_2–C_6–alkynylcarbonyl, C_3–C_6–cycloalkylcarbonyl, C_1–C_6–alkoxycarbonyl, C_3–C_6–alkenyloxycarbonyl, C_3–C_6–alkynyloxycarbonyl, (C_1-C_{20}-alkylthio)carbonyl, C_1–C_6–alkylaminocarbonyl, C_3–C_6–alkenylaminocarbonyl, C_3–C_6–alkynylaminocarbonyl, N,N-di-(C_1–C_6–alkyl)aminocarbonyl,

N–(C_3–C_6–alkenyl)–N–(C_1–C_6–alkyl)aminocarbonyl, N–(C_3–C_6–alkynyl)–N–(C_1–C_6–alkyl)aminocarbonyl, N–(C_1–C_6–alkoxy)–N–(C_1–C_6-alkyl)aminocarbonyl, N–(C_3–C_6–alkenyl)-N–(C_1–C_6–alkoxy)aminocarbonyl, N–(C_3–C_6–alkynyl)-N–(C_1–C_6–alkoxy)aminocarbonyl, di–(C_1–C_6–alkyl)-aminothiocarbonyl, C_1–C_6–alkylcarbonyl–C_1–C_6–alkyl, C_1–C_6–alkoxyimino–C_1–C_6–alkyl, N–(C_1–C_6–alkylamino)imino–C_1–C_6–alkyl or N,N–di–(C_1–C_6–alkylamino)imino–C_1–C_6–alkyl, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three of the following groups:

cyano, C_1–C_4–alkoxy, C_1–C_4–alkylthio, di–(C_1–C_4–alkyl)amino, C_1–C_4–alkylcarbonyl, C_1–C_4–alkoxycarbonyl, C_1–C_4–alkoxy–C_1–C_4–alkoxycarbonyl, di–(C_1–C_4–alkyl)amino–C_1–C_4–alkoxycarbonyl, hydroxycarbonyl, C_1–C_4–alkylaminocarbonyl, di–(C_1–C_4–alkyl)aminocarbonyl, aminocarbonyl, C_1–C_4–alkylcarbonyloxy or C_3–C_6–cycloalkyl;

phenyl, heterocyclyl, phenyl–C_1–C_6–alkyl, heterocyclyl–C_1–C_6–alkyl, phenylcarbonyl–C_1–C_6–alkyl, heterocyclylcarbonyl–C_1–C_6–alkyl, phenylcarbonyl, heterocyclylcarbonyl, phenoxycarbonyl, heterocyclyloxycarbonyl, phenoxythiocarbonyl, heterocyclyloxythiocarbonyl, phenoxy-C_1-C_6-alkylcarbonyl, heterocyclyloxy-C_1-C_6-alkylcarbonyl, phenylaminocarbonyl, N–(C_1–C_6–alkyl)–N–(phenyl)aminocarbonyl, heterocyclylaminocarbonyl, N–(C_1–C_6–alkyl)–N–(heterocyclyl)aminocarbonyl, phenyl–C_2–C_6–alkenylcarbonyl or heterocyclyl–C_2–C_6–alkenylcarbonyl, where the phenyl and the heterocyclyl radical of the 20 last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:
nitro, cyano, C_1–C_4–alkyl, C_1–C_4–haloalkyl, C_1–C_4–alkoxy or C_1–C_4–haloalkoxy;

R^8, R^9 are C_1–C_6–alkyl, C_3–C_6–alkenyl, C_3–C_6–haloalkenyl, C_3–C_6–alkynyl, C_3–C_6–haloalkynyl, C_3–C_6–cycloalkyl, hydroxyl, C_1–C_6-alkoxy, amino, C_1–C_6–alkylamino, C_1–C_6–haloalkylamino, di-(C_1–C_6–alkyl)amino or di-(C_1–C_6–haloalkyl)amino, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three of the following groups:
cyano, C_1–C_4–alkoxy, C_1–C_4–alkylthio, di–(C_1–C_4–alkyl)amino, C_1–C_4–alkylcarbonyl, C_1–C_4–alkoxycarbonyl, C_1–C_4–alkoxy–C_1–C_4–alkoxycarbonyl, di–(C_1–C_4–alkyl)amino–C_1–C_4–alkoxycarbonyl, hydroxycarbonyl, C_1_C_4_alkylaminocarbonyl, di–(C_1–C_4–alkyl)aminocarbonyl, aminocarbonyl, C_1–C_4–alkylcarbonyloxy or C_3–C_6–cycloalkyl;

phenyl, heterocyclyl, phenyl–C_1–C_6–alkyl, heterocyclyl–C_1–C_6–alkyl, phenoxy, heterocyclyloxy, where the phenyl and the heterocyclyl radical of the last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:
nitro, cyano, C_1–C_4–alkyl, C_1–C_4–haloalkyl, C_1–C_4–alkoxy or C_1–C_4–haloalkoxy;

R^{10} is C_1-C_6-alkyl, C_3-C_6-alkenyl, C_3-C_6-haloalkenyl, C_3-C_6-alkynyl, C_3-C_6-haloalkynyl, C_3-C_6-cycloalkyl, hydroxyl, C_1-C_6-alkoxy, C_3-C_6-alkenyloxy, C_3-C_6-alkynyloxy, amino, C_1-C_6-alkylamino, di-(C_1-C_6-alkyl)amino or C_1-C_6-alkylcarbonylamino, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three radicals from the following group:
cyano, C_1-C_4-alkoxy, C_1-C_4-alkylthio, di-(C_1-C_4-alkyl)amino, C_1-C_4-alkylcarbonyl, C_1-C_4-alkoxycarbonyl, C_1-C_4-alkoxy-C_1-C_4-alkoxycarbonyl, di-(C_1-C_4-alkyl)amino-C_1-C_4-alkoxycarbonyl, hydroxycarbonyl, C_1-C_4-alkylaminocarbonyl, di-(C_1-C_4-alkyl)aminocarbonyl, aminocarbonyl, C_1-C_4-alkylcarbonyloxy or C_3-C_6-cycloalkyl;

phenyl, heterocyclyl, phenyl-C_1-C_6-alkyl or heterocyclyl-C_1-C_6-alkyl, where the phenyl or heterocyclyl radical of the four last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:
nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

R^{11}, R^{12} are C_1-C_6-alkyl, C_3-C_6-alkenyl, C_3-C_6-alkynyl or C_1-C_6-alkylcarbonyl;

l is 0 to 6;

m is 2 to 4;

n is 1 to 5;

p is 2 to 5;

and their agriculturally useful salts.

Moreover, the invention relates to processes for preparing compounds of the formula I, to compositions comprising them and to the use of these derivatives or the compositions comprising them for controlling harmful plants.

The literature, for example WO 98/12 180 and EP-A 283 261, discloses quinolinoyl or fused phenyl derivatives which are linked to an unsubstituted or substituted (1-hydroxy-3-oxo-cyclohex-1-en-2-yl)carbonyl radical. However, the herbicidal properties of the prior art compounds and their compatibility with crop plants are not entirely satisfactory.

It is an object of the present invention to provide other biologically, in particular herbicidally, active compounds.

We have found that this object is achieved by the cyclohexenonequinolinoyl derivatives of the formula I and their herbicidal action.

Furthermore, we have found herbicidal compositions which comprise the compounds I and have very good herbicidal action. Moreover, we have found processes for pr paring these compositions and

methods for controlling undesirable vegetation using the compounds I.

Depending on the substitution pattern, the compounds of the formula I may contain one or more chiral centers, in which case they are present as enantiomers or mixtures of diastereomers. The invention provides both the pure enantiomers or diastereomers and their mixtures.

The compounds of the formula I may also be present in the form of their agriculturally useful salts, where the type of salt is usually immaterial. In general, the salts of those cations and the acid addition salts of those acids are suitable whose cations and anions, respectively, do not negatively affect the herbicidal action of the compounds I.

Suitable cations are, in particular, ions of the alkali metals, preferably lithium, sodium and potassium, of the alkaline earth metals, preferably calcium and magnesium, and of the transition metals, preferably manganese, copper, zinc and iron, and also ammonium, where, if desired, one to four hydrogen atoms may be replaced by C_1–C_4–alkyl, hydroxy–C_1–C_4–alkyl, C_1-C_4-alkoxy-C_1-C_4-alkyl, hydroxy-C_1-C_4-alkoxy-C_1-C_4-alkyl, phenyl or benzyl, preferably ammonium, dimethylammonium, diisopropylammonium, tetramethylammonium, tetrabutylammonium, 2-(2-hydroxyeth-1-oxy)eth-1-ylammonium, di(2-hydroxyeth-1-yl)ammonium, trimethylbenzylammonium, furthermore phosphonium ions, sulfonium ions, preferably tri(C_1–C_4–alkyl)sulfonium and sulfoxonium ions, preferably tri(C_1–C_4–alkyl)sulfoxonium.

Anions of useful acid addition salts are primarily chloride, bromide, fluoride, hydrogen sulfate, sulfate, dihydrogen phosphate, hydrogen phosphate, nitrate, hydrogen carbonate, carbonate, hexafluorosilicate, hexafluorophosphate, benzoate and also the anions of C_1–C_4–alkanoic acids, preferably formate, acetate, propionate and butyrate.

The organic moieties mentioned for the substituents R^1–R^{12} or as radicals on phenyl and heterocyclyl radicals are collective terms for individual enumerations of the particular group members. All hydrocarbon chains, i.e. all alkyl, haloalkyl, alkoxy, haloalkoxy, alkylthio, haloalkylthio, alkylsulfynyl, haloalkylsulfynyl, alkylsulfonyl, haloalkylsulfonyl, N–alkylaminosulfonyl, N,N–dialkylaminosulfonyl, N-alkylamino, N,N-dialkylamino, N-haloalkylamino, N-alkoxyamino,

N-alkoxy-N-alkylamino, N-alkylcarbonylamino, N–alkylsulfonylamino, N–haloalkylsulfonylamino, N–alkyl–N–alkylsulfonylamino, N–alkyl–N–haloalkylsulfonylamino, alkylcarbonyl, haloalkylcarbonyl, alkoxycarbonyl, haloalkoxycarbonyl, alkylthiocarbonyl, alkylcarbonyloxy, alkylaminocarbonyl, dialkylaminocarbonyl, dialkylaminothiocarbonyl, alkoxyalkyl, dialkoxymethyl, dialkylthiomethyl, (alkoxy)(alkylthio)methyl, alkylcarbonylalkyl, alkoxyiminomethyl, alkoxyiminoalkyl, N–(alkylamino)iminoalkyl, N–(dialkylamino)iminoalkyl, phenylalkenylcarbonyl, heterocyclylalkenylcarbonyl, phenoxyalkylcarbonyl, heterocyclyloxyalkylcarbonyl, N–alkoxy–N–alkylaminocarbonyl, N–alkyl–N–phenylaminocarbonyl, N–alkyl–N–heterocyclylaminocarbonyl, alkoxycarbonyloxy, phenylalkyl, heterocyclylalkyl, phenylcarbonylalkyl, heterocyclylcarbonylalkyl, dialkylaminoalkoxycarbonyl, alkoxyalkoxycarbonyl, alkenylcarbonyl, alkenyloxycarbonyl, alkenylaminocarbonyl, N–alkenyl–N–alkylaminocarbonyl, N–alkenyl–N–alkoxyaminocarbonyl, alkynylcarbonyl, alkynyloxycarbonyl, alkynylaminocarbonyl, N–alkynyl–N–alkylaminocarbonyl, N–alkynyl–N–alkoxyaminocarbonyl, alkenyl, alkynyl, haloalkenyl, haloalkynyl, alkenyloxy, alkynyloxy and alkoxyalkoxy moieties, may be straight-chain or branched. Unless indicated otherwise, halogenated substituents preferably carry one to five identical or different halogen atoms. The term "halogen" in each case represents fluorine, chlorine, bromine or iodine.

Examples of other meanings are:

- C_1–C_4–alkyl: for example methyl, ethyl, propyl, 1–methylethyl, butyl, 1–methylpropyl, 2–methylpropyl or 1,1–dimethylethyl;

- C_1–C_6–alkyl, and the alkyl moieties of C_1–C_6–alkoxyimino–C_1–C_6–alkyl, N–(C_1–C_6–alkylamino)imino–C_1–C_6–alkyl, N–(di–C_1–C_6–alkylamino)imino–C_1–C_6–alkyl, N–(C_1–C_6–alkoxy)–N–(C_1–C_6–alkyl)–aminocarbonyl, N–(C_3–C_6–alkenyl)–N–(C_1–C_6–alkyl)aminocarbonyl, (C_3–C_6–alkynyl)–N–(C_1–C_6–alkyl)aminocarbonyl, N–(C_1–C_6–alkyl)–N–phenylaminocarbonyl, N–(C_1–C_6–alkyl)–N–heterocyclylaminocarbonyl, phenyl–C_1–C_6–alkyl, N–(C_1–C_6–alkyl)–N–(C_1–C_6–alkylsulfonyl)amino, N–(C_1–C_6–alkyl)–N–(C_1–C_6–haloalkylsulfonyl)amino, heterocyclyl–C_1–C_6–alkyl, phenylcarbonyl–C_1–C_6–alkyl, heterocyclylcarbonyl–C_1–C_6–alkyl:

C_1–C_4–alkyl as mentioned above, and also, for example, pentyl, 1–methylbutyl, 2–methylbutyl, 3–methylbutyl, 2,2–dimethylpropyl, 1–ethylpropyl, hexyl, 1,1–dimethylpropyl, 1,2–dimethylpropyl, 1–methylpentyl, 2–methylpentyl, 3–methylpentyl, 4–methylpentyl, 1,1–dimethylbutyl, 1,2–dimethylbutyl, 1,3–dimethylbutyl, 2,2–dimethylbutyl, 2,3–dimethylbutyl, 3,3–dimethylbutyl, 1–ethylbutyl, 2–ethylbutyl, 1,1,2–trimethylpropyl, 1–ethyl–1–methylpropyl or 1–ethyl–3–methylpropyl;

- C_1–C_4–haloalkyl: a C_1–C_4–alkyl radical as mentioned above which is partially or fully substituted by fluorine, chlorine, bromine and/or iodine, i.e., for example, chloromethyl, dichloromethyl, trichloromethyl, fluoromethyl, difluoromethyl, trifluoromethyl, chlorofluoromethyl, dichlorofluoromethyl, chlorodifluoromethyl, 2-fluoroethyl, 2-chloroethyl, 2-bromoethyl, 2-iodoethyl, 2,2-difluoroethyl, 2,2,2-trifluoroethyl, 2-chloro-2-fluoroethyl, 2-chloro-2,2-difluoroethyl, 2,2-dichloro-2-fluoroethyl, 2,2,2-trichloroethyl, pentafluoroethyl, 2-fluoropropyl, 3-fluoropropyl, 2,2-difluoropropyl, 2,3-difluoropropyl, 2-chloropropyl, 3-chloropropyl, 2,3-dichloropropyl, 2-bromopropyl, 3-bromopropyl, 3,3,3-trifluoropropyl, 3,3,3-trichloropropyl, 2,2,3,3,3-pentafluoropropyl, heptafluoropropyl, 1-(fluoromethyl)-2-fluoroethyl, 1-(chloromethyl)-2-chloroethyl, 1-(bromomethyl)-2-bromoethyl, 4-fluorobutyl, 4-chlorobutyl, 4-bromobutyl or nonafluorobutyl;

- C_1–C_6–haloalkyl, and the haloalkyl moieties of N-C_1-C_6-haloalkylamino: C_1–C_4–haloalkyl, as mentioned above, and also, for example, 5–fluoropentyl, 5–chloropentyl, 5–bromopentyl, 5–iodopentyl, undecafluoropentyl, 6–fluorohexyl, 6–chlorohexyl, 6–bromohexyl, 6–iodohexyl or dodecafluorohexyl;

- C_1–C_4–alkoxy: for example methoxy, ethoxy, propoxy, 1–methylethoxy, butoxy, 1–methylpropoxy, 2–methylpropoxy or 1,1–dimethylethoxy;

- C_1–C_6–alkoxy, and the alkoxy moieties of N-C_1-C_6-alkoxyamino, di-(C_1-C_6-alkoxy)methyl, (C_1-C_6-alkoxy)(C_1-C_6-alkylthio)-methyl, C_1-C_6-alkoxyiminomethyl, C_1–C_6–alkoxyimino–C_1–C_6–alkyl, N–(C_1–C_6–alkoxy)–N–(C_1–C_6–alkyl)aminocarbonyl, N–(C_3–C_6–alkenyl)–N–(C_1–C_6–alkoxy)aminocarbonyl and

N-(C_3-C_6-alkynyl)-N-(C_1-C_6-alkoxy)aminocarbonyl: C_1-C_4-alkoxy as mentioned above, and also, for example, pentoxy, 1-methylbutoxy, 2-methylbutoxy, 3-methylbutoxy, 1,1-dimethylpropoxy, 1,2-dimethylpropoxy, 2,2-dimethylpropoxy, 1-ethylpropoxy, hexoxy, 1-methylpentoxy, 2-methylpentoxy, 3-methylpentoxy, 4-methylpentoxy, 1,1-dimethylbutoxy, 1,2-dimethylbutoxy, 1,3-dimethylbutoxy, 2,2-dimethylbutoxy, 2,3-dimethylbutoxy, 3,3-dimethylbutoxy, 1-ethylbutoxy, 2-ethylbutoxy, 1,1,2-trimethylpropoxy, 1,2,2-trimethylpropoxy, 1-ethyl-1-methylpropoxy or 1-ethyl-2-methylpropoxy;

- C_1-C_4-haloalkoxy: a C_1-C_4-alkoxy radical as mentioned above which is partially or fully substituted by fluorine, chlorine, bromine and/or iodine, i.e., for example, fluoromethoxy, difluoromethoxy, trifluoromethoxy, chlorodifluoromethoxy, bromodifluoromethoxy, 2-fluoroethoxy, 2-chloroethoxy, 2-bromomethoxy, 2-iodoethoxy, 2,2-difluoroethoxy, 2,2,2-trifluoroethoxy, 2-chloro-2-fluoroethoxy, 2-chloro-2,2-difluoroethoxy, 2,2-dichloro-2-fluoroethoxy, 2,2,2-trichloroethoxy, pentafluoroethoxy, 2-fluoropropoxy, 3-fluoropropoxy, 2-chloropropoxy, 3-chloropropoxy, 2-bromopropoxy, 3-bromopropoxy, 2,2-difluoropropoxy, 2,3-difluoropropoxy, 2,3-dichloropropoxy, 3,3,3-trifluoropropoxy, 3,3,3-trichloropropoxy, 2,2,3,3,3-pentafluoropropoxy, heptafluoropropoxy, 1-(fluoromethyl)-2-fluoroethoxy, 1-(chloromethyl)-2-chloroethoxy, 1-(bromomethyl)-2-bromoethoxy, 4-fluorobutoxy, 4-chlorobutoxy, 4-bromobutoxy or nonafluorobutoxy;

- C_1-C_6-haloalkoxy: C_1-C_4-haloalkoxy as mentioned above, and also, for example, 5-fluoropentoxy, 5-chloropentoxy, 5-bromopentoxy, 5-iodopentoxy, undecafluoropentoxy, 6-fluorohexoxy, 6-chlorohexoxy, 6-bromohexoxy, 6-iodohexoxy or dodecafluorohexoxy;

- C_1-C_4-alkylthio: for example methylthio, ethylthio, propylthio, 1-methylethylthio, butylthio, 1-methylpropylthio, 2-methylpropylthio or 1,1-dimethylethylthio;

- C_1-C_6-alkylthio, and the alkylthio moieties of (C_1-C_6-alkylthio)carbonyl, di-(C_1-C_6-alkylthio)methyl and (C_1-C_6-alkoxy)-(C_1-C_6-alkylthio)methyl: C_1-C_4-alkylthio as mentioned above, and also, for example, pentylthio, 1-methylbutylthio, 2-methylbutylthio, 3-methylbutylthio,

2,2-dimethylpropylthio, 1-ethylpropylthio, hexylthio, 1,1-dimethylpropylthio, 1,2-dimethylpropylthio, 1-methylpentylthio, 2-methylpentylthio, 3-methylpentylthio, 4-methylpentylthio, 1,1-dimethylbutylthio, 1,2-dimethylbutylthio, 1,3-dimethylbutylthio, 2,2-dimethylbutylthio, 2,3-dimethylbutylthio, 3,3-dimethylbutylthio, 1-ethylbutylthio, 2-ethylbutylthio, 1,1,2-trimethylpropylthio, 1,2,2-trimethylpropylthio, 1-ethyl-1-methylpropylthio or 1-ethyl-2-methylpropylthio;

- C_1-C_{20}-alkylthio as alkylthio radical of (C_1-C_{20}-alkylthio)carbonyl: C_1-C_6-alkylthio as mentioned above, and also, for example, heptylthio, octylthio, hexadecylthio or octadecylthio;

- C_1-C_4-haloalkylthio: a C_1-C_4-alkylthio radical as mentioned above which is partially or fully substituted by fluorine, chlorine, bromine and/or iodine, i.e., for example, fluoromethylthio, difluoromethylthio, trifluoromethylthio, chlorodifluoromethylthio, bromodifluoromethylthio, 2-fluoroethylthio, 2-chloroethylthio, 2-bromoethylthio, 2-iodoethylthio, 2,2-difluoroethylthio, 2,2,2-trifluoroethylthio, 2,2,2-trichloroethylthio, 2-chloro-2-fluoroethylthio, 2-chloro-2,2-difluoroethylthio, 2,2-dichloro-2-fluoroethylthio, pentafluoroethylthio, 2-fluoropropylthio, 3-fluoropropylthio, 2-chloropropylthio, 3-chloropropylthio, 2-bromopropylthio, 3-bromopropylthio, 2,2-difluoropropylthio, 2,3-difluoropropylthio, 2,3-dichloropropylthio, 3,3,3-trifluoropropylthio, 3,3,3-trichloropropylthio, 2,2,3,3,3-pentafluoropropylthio, heptafluoropropylthio, 1-(fluoromethyl)-2-fluoroethylthio, 1-(chloromethyl)-2-chloroethylthio, 1-(bromomethyl)-2-bromoethylthio, 4-fluorobutylthio, 4-chlorobutylthio, 4-bromobutylthio or nonafluorobutylthio;

- C_1-C_6-haloalkylthio: C_1-C_4-haloalkylthio, as mentioned above, and also, for example, 5-fluoropentylthio, 5-chloropentylthio, 5-bromopentylthio, 5-iodopentylthio, undecafluoropentylthio, 6-fluorohexylthio, 6-chlorohexylthio, 6-bromohexylthio, 6-iodohexylthio or dodecafluorohexylthio;

- C_1-C_6-alkylsulfinyl (C_1-C_6-alkyl-S(=O)-): for example methylsulfinyl, ethylsulfinyl, propylsulfinyl, 1-methylethylsulfinyl, butylsulfinyl, 1-methylpropylsulfinyl, 2-methylpropylsulfinyl, 1,1-dimethylethylsulfinyl, pentylsulfinyl, 1-methylbutylsulfinyl, 2-methylbutylsulfinyl,

3-methylbutylsulfinyl, 2,2-dimethylpropylsulfinyl, 1-ethylpropylsulfinyl, 1,1-dimethylpropylsulfinyl, 1,2-dimethylpropylsulfinyl, hexylsulfinyl, 1-methylpentylsulfinyl, 2-methylpentylsulfinyl, 3-methylpentylsulfinyl, 4-methylpentylsulfinyl, 1,1-dimethylbutylsulfinyl, 1,2-dimethylbutylsulfinyl, 1,3-dimethylbutylsulfinyl, 2,2-dimethylbutylsulfinyl, 2,3-dimethylbutylsulfinyl, 3,3-dimethylbutylsulfinyl, 1-ethylbutylsulfinyl, 2-ethylbutylsulfinyl, 1,1,2-trimethylpropylsulfinyl, 1,2,2-trimethylpropylsulfinyl, 1-ethyl-1-methylpropylsulfinyl or 1-ethyl-2-methylpropylsulfinyl;

- C_1–C_6-haloalkylsulfinyl: a C_1–C_6-alkylsulfinyl radical as mentioned above which is partially or fully substituted by fluorine, chlorine, bromine and/or iodine, i.e., for example, fluoromethylsulfinyl, difluoromethylsulfinyl, trifluoromethylsulfinyl, chlorodifluoromethylsulfinyl, bromodifluoromethylsulfinyl, 2-fluoroethylsulfinyl, 2-chloroethylsulfinyl, 2-bromoethylsulfinyl, 2-iodoethylsulfinyl, 2,2-difluoroethylsulfinyl, 2,2,2-trifluoroethylsulfinyl, 2,2,2-trichloroethylsulfinyl, 2-chloro-2-fluoroethylsulfinyl, 2-chloro-2,2-difluoroethylsulfinyl, 2,2-dichloro-2-fluoroethylsulfinyl, pentafluoroethylsulfinyl, 2-fluoropropylsulfinyl, 3-fluoropropylsulfinyl, 2-chloropropylsulfinyl, 3-chloropropylsulfinyl, 2-bromopropylsulfinyl, 3-bromopropylsulfinyl, 2,2-difluoropropylsulfinyl, 2,3-difluoropropylsulfinyl, 2,3-dichloropropylsulfinyl, 3,3,3-trifluoropropylsulfinyl, 3,3,3-trichloropropylsulfinyl, 2,2,3,3,3-pentafluoropropylsulfinyl, heptafluoropropylsulfinyl, 1-(fluoromethyl)-2-fluoroethylsulfinyl, 1-(chloromethyl)-2-chloroethylsulfinyl, 1-(bromomethyl)-2-bromoethylsulfinyl, 4-fluorobutylsulfinyl, 4-chlorobutylsulfinyl, 4-bromobutylsulfinyl, nonafluorobutylsulfinyl, 5-fluoropentylsulfinyl, 5-chloropentylsulfinyl, 5-bromopentylsulfinyl, 5-iodopentylsulfinyl, undecafluoropentylsulfinyl, 6-fluorohexylsulfinyl, 6-chlorohexylsulfinyl, 6-bromohexylsulfinyl, 6-iodohexylsulfinyl or dodecafluorohexylsulfinyl;

- C_1–C_6-alkylsulfonyl (C_1–C_6-alkyl–S(=O)$_2$–), and the alkylsulfonyl radicals of N-(C_1–C_6-alkylsulfonyl)amino and N-(C_1–C_6-alkyl)-N-(C_1–C_6-alkylsulfonyl)amino: for example,

methylsulfonyl, ethylsulfonyl, propylsulfonyl, 1-methylethylsulfonyl, butylsulfonyl, 1-methylpropylsulfonyl, 2-methylpropylsulfonyl, 1,1-dimethylethylsulfonyl, pentylsulfonyl, 1-methylbutylsulfonyl, 2-methylbutylsulfonyl, 3-methylbutylsulfonyl, 1,1-dimethylpropylsulfonyl, 1,2-dimethylpropylsulfonyl, 2,2-dimethylpropylsulfonyl, 1-ethylpropylsulfonyl, hexylsulfonyl, 1-methylpentylsulfonyl, 2-methylpentylsulfonyl, 3-methylpentylsulfonyl, 4-methylpentylsulfonyl, 1,1-dimethylbutylsulfonyl, 1,2-dimethylbutylsulfonyl, 1,3-dimethylbutylsulfonyl, 2,2-dimethylbutylsulfonyl, 2,3-dimethylbutylsulfonyl, 3,3-dimethylbutylsulfonyl, 1-ethylbutylsulfonyl, 2-ethylbutylsulfonyl, 1,1,2-trimethylpropylsulfonyl, 1,2,2-trimethylpropylsulfonyl, 1-ethyl-1-methylpropylsulfonyl or 1-ethyl-2-methylpropylsulfonyl;

- C_1-C_6-haloalkylsulfonyl, and the haloalkylsulfonyl radicals of N-(C_1-C_6-haloalkylsulfonyl)amino and N-(C_1-C_6-alkyl)-N-(C_1-C_6-haloalkylsulfonyl)amino: a C_1-C_6-alkylsulfonyl radical as mentioned above which is partially or fully substituted by fluorine, chlorine, bromine and/or iodine, i.e., for example, fluoromethylsulfonyl, difluoromethylsulfonyl, trifluoromethylsulfonyl, chlorodifluoromethylsulfonyl, bromodifluoromethylsulfonyl, 2-fluoroethylsulfonyl, 2-chloroethylsulfonyl, 2-bromoethylsulfonyl, 2-iodoethylsulfonyl, 2,2-difluoroethylsulfonyl, 2,2,2-trifluoroethylsulfonyl, 2-chloro-2-fluoroethylsulfonyl, 2-chloro-2,2-difluoroethylsulfonyl, 2,2-dichloro-2-fluoroethylsulfonyl, 2,2,2-trichloroethylsulfonyl, pentafluoroethylsulfonyl, 2-fluoropropylsulfonyl, 3-fluoropropylsulfonyl, 2-chloropropylsulfonyl, 3-chloropropylsulfonyl, 2-bromopropylsulfonyl, 3-bromopropylsulfonyl, 2,2-difluoropropylsulfonyl, 2,3-difluoropropylsulfonyl, 2,3-dichloropropylsulfonyl, 3,3,3-trifluoropropylsulfonyl, 3,3,3-trichloropropylsulfonyl, 2,2,3,3,3-pentafluoropropylsulfonyl, heptafluoropropylsulfonyl, 1-(fluoromethyl)-2-fluoroethylsulfonyl, 1-(chloromethyl)-2-chloroethylsulfonyl, 1-(bromomethyl)-2-bromoethylsulfonyl, 4-fluorobutylsulfonyl, 4-chlorobutylsulfonyl, 4-bromobutylsulfonyl, nonafluorobutylsulfonyl, 5-fluoropentylsulfonyl, 5-chloropentylsulfonyl, 5-bromopentylsulfonyl, 5-iodopentylsulfonyl, 6-fluorohexylsulfonyl,

6-bromohexylsulfonyl, 6-iodohexylsulfonyl or dodecafluorohexylsulfonyl;

- C_1-C_6-alkylamino, and the alkylamino radicals of N-(C_1-C_6-alkylamino)imino-C_1-C_6-alkyl: for example methylamino, ethylamino, propylamino, 1-methylethylamino, butylamino, 1-methylpropylamino, 2-methylpropylamino, 1,1-dimethylethylamino, pentylamino, 1-methylbutylamino, 2-methylbutylamino, 3-methylbutylamino, 2,2-dimethylpropylamino, 1-ethylpropylamino, hexylamino, 1,1-dimethylpropylamino, 1,2-dimethylpropylamino, 1-methylpentylamino, 2-methylpentylamino, 3-methylpentylamino, 4-methylpentylamino, 1,1-dimethylbutylamino, 1,2-dimethylbutylamino, 1,3-dimethylbutylamino, 2,2-dimethylbutylamino, 2,3-dimethylbutylamino, 3,3-dimethylbutylamino, 1-ethylbutylamino, 2-ethylbutylamino, 1,1,2-trimethylpropylamino, 1,2,2-trimethylpropylamino, 1-ethyl-1-methylpropylamino or 1-ethyl-2-methylpropylamino;

- (C_1-C_4-alkylamino)sulfonyl: for example methylaminosulfonyl, ethylaminosulfonyl, propylaminosulfonyl, 1-methylethylaminosulfonyl, butylaminosulfonyl, 1-methylpropylaminosulfonyl, 2-methylpropylaminosulfonyl or 1,1-dimethylethylaminosulfonyl;

- (C_1-C_6-alkylamino)sulfonyl: (C_1-C_4-alkylamino)sulfonyl, as mentioned above, and also, for example, pentylaminosulfonyl, 1-methylbutylaminosulfonyl, 2-methylbutylaminosulfonyl, 3-methylbutylaminosulfonyl, 2,2-dimethylpropylaminosulfonyl, 1-ethylpropylaminosulfonyl, hexylaminosulfonyl, 1,1-dimethylpropylaminosulfonyl, 1,2-dimethylpropylaminosulfonyl, 1-methylpentylaminosulfonyl, 2-methylpentylaminosulfonyl, 3-methylpentylaminosulfonyl, 4-methylpentylaminosulfonyl, 1,1-dimethylbutylaminosulfonyl, 1,2-dimethylbutylaminosulfonyl, 1,3-dimethylbutylaminosulfonyl, 2,2-dimethylbutylaminosulfonyl, 2,3-dimethylbutylaminosulfonyl, 3,3-dimethylbutylaminosulfonyl, 1-ethylbutylaminosulfonyl, 2-ethylbutylaminosulfonyl, 1,1,2-trimethylpropylaminosulfonyl, 1,2,2-trimethylpropylaminosulfonyl, 1-ethyl-1-methylpropylaminosulfonyl or 1-ethyl-2-methylpropylaminosulfonyl;

- di-(C_1-C_4-alkyl)aminosulfonyl: for example N,N-dimethylaminosulfonyl, N,N-diethylaminosulfonyl, N,N-di-(1-methylethyl)aminosulfonyl, N,N-dipropylaminosulfonyl, N,N-dibutylaminosulfonyl, N,N-di-(1-methylpropyl)aminosulfonyl, N,N-di-(2-methylpropyl)aminosulfonyl, N,N-di-(1,1-dimethylethyl)aminosulfonyl, N-ethyl-N-methylaminosulfonyl, N-methyl-N-propylaminosulfonyl, N-methyl-N-(1-methylethyl)aminosulfonyl, N-butyl-N-methylaminosulfonyl, N-methyl-N-(1-methylpropyl)aminosulfonyl, N-methyl-N-(2-methylpropyl)aminosulfonyl, N-(1,1-dimethylethyl)-N-methylaminosulfonyl, N-ethyl-N-propylaminosulfonyl, N-ethyl-N-(1-methylethyl)aminosulfonyl, N-butyl-N-ethylaminosulfonyl, N-ethyl-N-(1-methylpropyl)aminosulfonyl, N-ethyl-N-(2-methylpropyl)aminosulfonyl, N-ethyl-N-(1,1-dimethylethyl)aminosulfonyl, N-(1-methylethyl)-N-propylaminosulfonyl, N-butyl-N-propylaminosulfonyl, N-(1-methylpropyl)-N-propylaminosulfonyl, N-(2-methylpropyl)-N-propylaminosulfonyl, N-(1,1-dimethylethyl)-N-propylaminosulfonyl, N-butyl-N-(1-methylethyl)aminosulfonyl, N-(1-methylethyl)-N-(1-methylpropyl)aminosulfonyl, N-(1-methylethyl)-N-(2-methylpropyl)aminosulfonyl, N-(1,1-dimethylethyl)-N-(1-methylethyl)aminosulfonyl, N-butyl-N-(1-methylpropyl)aminosulfonyl, N-butyl-N-(2-methylpropyl)aminosulfonyl, N-butyl-N-(1,1-dimethylethyl)aminosulfonyl, N-(1-methylpropyl)-N-(2-methylpropyl)aminosulfonyl, N-(1,1-dimethylethyl)-N-(1-methylpropyl)aminosulfonyl or N-(1,1-dimethylethyl)-N-(2-methylpropyl)aminosulfonyl;

- di-(C_1-C_6-alkyl)aminosulfonyl: di-(C_1-C_4-alkyl)aminosulfonyl, as mentioned above, and also, for example, N-methyl-N-pentylaminosulfonyl, N-methyl-N-(1-methylbutyl)aminosulfonyl, N-methyl-N-(2-methylbutyl)aminosulfonyl, N-methyl-N-(3-methylbutyl)aminosulfonyl, N-methyl-N-(2,2-dimethylpropyl)aminosulfonyl, N-methyl-N-(1-ethylpropyl)aminosulfonyl, N-methyl-N-hexylaminosulfonyl, N-methyl-N-(1,1-dimethylpropyl)aminosulfonyl, N-methyl-N-(1,2-dimethylpropyl)aminosulfonyl,

N-methyl-N-(1-methylpentyl)aminosulfonyl,
N-methyl-N-(2-methylpentyl)aminosulfonyl,
N-methyl-N-(3-methylpentyl)aminosulfonyl,
N-methyl-N-(4-methylpentyl)aminosulfonyl, N-methyl-N-(1,1-dimethylbutyl)aminosulfonyl,
N-methyl-N-(1,2-dimethylbutyl)aminosulfonyl,
N-methyl-N-(1,3-dimethylbutyl)aminosulfonyl,
N-methyl-N-(2,2-dimethylbutyl)aminosulfonyl,
N-methyl-N-(2,3-dimethylbutyl)aminosulfonyl, N-methyl-N-(3,3-dimethylbutyl)aminosulfonyl,
N-methyl-N-(1-ethylbutyl)aminosulfonyl,
N-methyl-N-(2-ethylbutyl)aminosulfonyl,
N-methyl-N-(1,1,2-trimethylpropyl)aminosulfonyl,
N-methyl-N-(1,2,2-trimethylpropyl)aminosulfonyl,
N-methyl-N-(1-ethyl-1-methylpropyl)aminosulfonyl, N-methyl-N-(1-ethyl-2-methylpropyl)aminosulfonyl,
N-ethyl-N-pentylaminosulfonyl,
N-ethyl-N-(1-methylbutyl)aminosulfonyl,
N-ethyl-N-(2-methylbutyl)aminosulfonyl,
N-ethyl-N-(3-methylbutyl)aminosulfonyl,
N-ethyl-N-(2,2-dimethylpropyl)aminosulfonyl,
N-ethyl-N-(1-ethylpropyl)aminosulfonyl,
N-ethyl-N-hexylaminosulfonyl,
N-ethyl-N-(1,1-dimethylpropyl)aminosulfonyl,
N-ethyl-N-(1,2-dimethylpropyl)aminosulfonyl,
N-ethyl-N-(1-methylpentyl)aminosulfonyl,
N-ethyl-N-(2-methylpentyl)aminosulfonyl,
N-ethyl-N-(3-methylpentyl)aminosulfonyl,
N-ethyl-N-(4-methylpentyl)aminosulfonyl,
N-ethyl-N-(1,1-dimethylbutyl)aminosulfonyl,
N-ethyl-N-(1,2-dimethylbutyl)aminosulfonyl,
N-ethyl-N-(1,3-dimethylbutyl)aminosulfonyl,
N-ethyl-N-(2,2-dimethylbutyl)aminosulfonyl,
N-ethyl-N-(2,3-dimethylbutyl)aminosulfonyl,
N-ethyl-N-(3,3-dimethylbutyl)aminosulfonyl,
N-ethyl-N-(1-ethylbutyl)aminosulfonyl,
N-ethyl-N-(2-ethylbutyl)aminosulfonyl,
N-ethyl-N-(1,1,2-trimethylpropyl)aminosulfonyl,
N-ethyl-N-(1,2,2-trimethylpropyl)aminosulfonyl,
N-ethyl-N-(1-ethyl-1-methylpropyl)aminosulfonyl,
N-ethyl-N-(1-ethyl-2-methylpropyl)aminosulfonyl,
N-propyl-N-pentylaminosulfonyl,
N-butyl-N-pentylaminosulfonyl, N,N-dipentylaminosulfonyl,
N-propyl-N-hexylaminosulfonyl, N-butyl-N-hexylaminosulfonyl,
N-pentyl-N-hexylaminosulfonyl or N,N-dihexylaminosulfonyl;

- di-(C_1-C_4-alkyl)amino and the dialkylamino radicals of: di-(C_1-C_4-alkyl)amino-C_1-C_4-alkoxycarbonyl and N-(di-C_1-C_4-alkylamino)imino-C_1-C_6-alkyl for example N,N-dimethylamino, N,N-diethylamino, N,N-dipropylamino, N,N-di-(1-methylethyl)amino, N,N-dibutylamino, N,N-di-(1-methylpropyl)amino, N,N-di-(2-methylpropyl)amino, N,N-di-(1,1-dimethylethyl)amino, N-ethyl-N-methylamino, N-methyl-N-propylamino, N-methyl-N-(1-methylethyl)amino, N-butyl-N-methylamino, N-methyl-N-(1-methylpropyl)amino, N-methyl-N-(2-methylpropyl)amino, N-(1,1-dimethylethyl)-N-methylamino, N-ethyl-N-propylamino, N-ethyl-N-(1-methylethyl)amino, N-butyl-N-ethylamino, N-ethyl-N-(1-methylpropyl)amino, N-ethyl-N-(2-methylpropyl)amino, N-ethyl-N-(1,1-dimethylethyl)amino, N-(1-methylethyl)-N-propylamino, N-butyl-N-propylamino, N-(1-methylpropyl)-N-propylamino, N-(2-methylpropyl)-N-propylamino, N-(1,1-dimethylethyl)-N-propylamino, N-butyl-N-(1-methylethyl)amino, N-(1-methylethyl)-N-(1-methylpropyl)amino, N-(1-methylethyl)-N-(2-methylpropyl)amino, N-(1,1-dimethylethyl)-N-(1-methylethyl)amino, N-butyl-N-(1-methylpropyl)amino, N-butyl-N-(2-methylpropyl)amino, N-butyl-N-(1,1-dimethylethyl)amino, N-(1-methylpropyl)-N-(2-methylpropyl)amino, N-(1,1-dimethylethyl)-N-(1-methylpropyl)amino or N-(1,1-dimethylethyl)-N-(2-methylpropyl)amino;

- di-(C_1-C_6-alkyl)amino, and the dialkylamino radicals of di-(C_1-C_6-alkyl)amino-imino-C_1-C_6-alkyl: di-(C_1-C_4-alkyl)amino as mentioned above, and also N,N-dipentylamino, N,N-dihexylamino, N-methyl-N-pentylamino, N-ethyl-N-pentylamino, N-methyl-N-hexylamino or N-ethyl-N-hexylamino;

- C_1-C_4-alkylcarbonyl: for example methylcarbonyl, ethylcarbonyl, propylcarbonyl, 1-methylethylcarbonyl, butylcarbonyl, 1-methylpropylcarbonyl, 2-methylpropylcarbonyl or 1,1-dimethylethylcarbonyl;

- C_1-C_6-alkylcarbonyl, and the alkylcarbonyl radicals of phenoxy-C_1-C_6-alkylcarbonyl, heterocyclyloxy-C_1-C_6-alkylcarbonyl, C_1-C_6-alkylcarbonylamino, C_1-C_6-alkylcarbonyl-C_1-C_6-alkyl: C_1-C_4-alkylcarbonyl, as

mentioned above, and also, for example, pentylcarbonyl, 1-methylbutylcarbonyl, 2-methylbutylcarbonyl, 3-methylbutylcarbonyl, 2,2-dimethylpropylcarbonyl, 1-ethylpropylcarbonyl, hexylcarbonyl, 1,1-dimethylpropylcarbonyl, 1,2-dimethylpropylcarbonyl, 1-methylpentylcarbonyl, 2-methylpentylcarbonyl, 3-methylpentylcarbonyl, 4-methylpentylcarbonyl, 1,1-dimethylbutylcarbonyl, 1,2-dimethylbutylcarbonyl, 1,3-dimethylbutylcarbonyl, 2,2-dimethylbutylcarbonyl, 2,3-dimethylbutylcarbonyl, 3,3-dimethylbutylcarbonyl, 1-ethylbutylcarbonyl, 2-ethylbutylcarbonyl, 1,1,2-trimethylpropylcarbonyl, 1,2,2-trimethylpropylcarbonyl, 1-ethyl-1-methylpropylcarbonyl or 1-ethyl-2-methylpropylcarbonyl;

- C_1-C_{20}-alkylcarbonyl: C_1-C_6-alkylcarbonyl, as mentioned above, and also heptylcarbonyl, octylcarbonyl, pentadecylcarbonyl or heptadecylcarbonyl;

- C_1-C_6-haloalkylcarbonyl: a C_1-C_6-alkylcarbonyl radical as mentioned above which is partially or fully substituted by fluorine, chlorine, bromine and/or iodine, i.e., for example, chloroacetyl, dichloroacetyl, trichloroacetyl, fluoroacetyl, difluoroacetyl, trifluoroacetyl, chlorofluoroacetyl, dichlorofluoroacetyl, chlorodifluoroacetyl, 2-fluoroethylcarbonyl, 2-chloroethylcarbonyl, 2-bromoethylcarbonyl, 2-iodoethylcarbonyl, 2,2-difluoroethylcarbonyl, 2,2,2-trifluoroethylcarbonyl, 2-chloro-2-fluoroethylcarbonyl, 2-chloro-2,2-difluoroethylcarbonyl, 2,2-dichloro-2-fluoroethylcarbonyl, 2,2,2-trichloroethylcarbonyl, pentafluoroethylcarbonyl, 2-fluoropropylcarbonyl, 3-fluoropropylcarbonyl, 2,2-difluoropropylcarbonyl, 2,3-difluoropropylcarbonyl, 2-chloropropylcarbonyl, 3-chloropropylcarbonyl, 2,3-dichloropropylcarbonyl, 2-bromopropylcarbonyl, 3-bromopropylcarbonyl, 3,3,3-trifluoropropylcarbonyl, 3,3,3-trichloropropylcarbonyl, 2,2,3,3,3-pentafluoropropylcarbonyl, heptafluoropropylcarbonyl, 1-(fluoromethyl)-2-fluoroethylcarbonyl, 1-(chloromethyl)-2-chloroethylcarbonyl, 1-(bromomethyl)-2-bromoethylcarbonyl, 4-fluorobutylcarbonyl, 4-chlorobutylcarbonyl, 4-bromobutylcarbonyl, nonafluorobutylcarbonyl, 5-fluoropentylcarbonyl, 5-chloropentylcarbonyl, 5-bromopentylcarbonyl, Perfluoropentylcarbonyl, 6-fluorohexylcarbonyl,

6-chlorohexylcarbonyl, 6-bromohexylcarbonyl or Perfluorohexylcarbonyl;

- C_1–C_4–alkoxycarbonyl, and the alkoxycarbonyl moieties of di–(C_1–C_4–alkyl)amino–C_1–C_4–alkoxycarbonyl, for example methoxycarbonyl, ethoxycarbonyl, propoxycarbonyl, 1–methylethoxycarbonyl, butoxycarbonyl, 1–methylpropoxycarbonyl, 2–methylpropoxycarbonyl or 1,1–dimethylethoxycarbonyl;

- (C_1-C_6-alkoxy)carbonyl, and the alkoxycarbonyl moieties of C_1-C_6-alkoxycarbonyloxy: (C_1–C_4–alkoxy)carbonyl, as mentioned above, and also, for example, pentoxycarbonyl, 1-methylbutoxycarbonyl, 2-methylbutoxycarbonyl, 3-methylbutoxycarbonyl, 2,2-dimethylpropoxycarbonyl, 1-ethylpropoxycarbonyl, hexoxycarbonyl, 1,1-dimethylpropoxycarbonyl, 1,2-dimethylpropoxycarbonyl, 1-methylpentoxycarbonyl, 2-methylpentoxycarbonyl, 3-methylpentoxycarbonyl, 4-methylpentoxycarbonyl, 1,1-dimethylbutoxycarbonyl, 1,2-dimethylbutoxycarbonyl, 1,3-dimethylbutoxycarbonyl, 2,2-dimethylbutoxycarbonyl, 2,3-dimethylbutoxycarbonyl, 3,3-dimethylbutoxycarbonyl, 1-ethylbutoxycarbonyl, 2-ethylbutoxycarbonyl, 1,1,2-trimethylpropoxycarbonyl, 1,2,2-trimethylpropoxycarbonyl, 1-ethyl-1-methylpropoxycarbonyl or 1-ethyl-2-methylpropoxycarbonyl;

- C_1–C_6–haloalkoxycarbonyl: a C_1–C_6–alkoxycarbonyl radical as mentioned above which is partially or fully substituted by fluorine, chlorine, bromine and/or iodine, i.e., for example, fluoromethoxycarbonyl, difluoromethoxycarbonyl, trifluoromethoxycarbonyl, chlorodifluoromethoxycarbonyl, bromodifluoromethoxycarbonyl, 2–fluoroethoxycarbonyl, 2–chloroethoxycarbonyl, 2–bromoethoxycarbonyl, 2–iodoethoxycarbonyl, 2,2–difluoroethoxycarbonyl, 2,2,2–trifluoroethoxycarbonyl, 2–chloro–2–fluoroethoxycarbonyl, 2–chloro–2,2–difluoroethoxycarbonyl, 2,2–dichloro–2–fluoroethoxycarbonyl, 2,2,2–trichloroethoxycarbonyl, pentafluoroethoxycarbonyl, 2–fluoropropoxycarbonyl, 3–fluoropropoxycarbonyl, 2–chloropropoxycarbonyl, 3–chloropropoxycarbonyl, 2–bromopropoxycarbonyl, 3–bromopropoxycarbonyl, 2,2–difluoropropoxycarbonyl, 2,3–difluoropropoxycarbonyl, 2,3–dichloropropoxycarbonyl, 3,3,3–trifluoropropoxycarbonyl, 3,3,3–trichloropropoxycarbonyl,

2,2,3,3,3–pentafluoropropoxycarbonyl, heptafluoropropoxycarbonyl, 1–(fluoromethyl)–2–fluoroethoxycarbonyl, 1–(chloromethyl)–2–chloroethoxycarbonyl, 1–(bromomethyl)–2–bromethoxycarbonyl, 4–fluorobutoxycarbonyl, 4–chlorobutoxycarbonyl, 4–bromobutoxycarbonyl, 4–iodobutoxycarbonyl, 5-fluoropentoxycarbonyl, 5-chloropentoxycarbonyl, 5-bromopentoxycarbonyl, 6-fluorohexoxycarbonyl, 6-chlorohexoxycarbonyl or 6-bromohexoxycarbonyl;

- (C_1–C_4–alkyl)carbonyloxy: acetyloxy, ethylcarbonyloxy, propylcarbonyloxy, 1–methylethylcarbonyloxy, butylcarbonyloxy, 1–methylpropylcarbonyloxy, 2–methylpropylcarbonyloxy or 1,1–dimethylethylcarbonyloxy;

- (C_1–C_4–alkylamino)carbonyl: for example methylaminocarbonyl, ethylaminocarbonyl, propylaminocarbonyl, 1–methylethylaminocarbonyl, butylaminocarbonyl, 1–methylpropylaminocarbonyl, 2–methylpropylaminocarbonyl or 1,1–dimethylethylaminocarbonyl;

- (C_1–C_6–alkylamino)carbonyl: (C_1–C_4–alkylamino)carbonyl, as mentioned above, and also, for example, pentylaminocarbonyl, 1-methylbutylaminocarbonyl, 2-methylbutylaminocarbonyl, 3-methylbutylaminocarbonyl, 2,2-dimethylpropylaminocarbonyl, 1-ethylpropylaminocarbonyl, hexylaminocarbonyl, 1,1-dimethylpropylaminocarbonyl, 1,2-dimethylpropylaminocarbonyl, 1-methylpentylaminocarbonyl, 2-methylpentylaminocarbonyl, 3-methylpentylaminocarbonyl, 4-methylpentylaminocarbonyl, 1,1-dimethylbutylaminocarbonyl, 1,2-dimethylbutylaminocarbonyl, 1,3-dimethylbutylaminocarbonyl, 2,2-dimethylbutylaminocarbonyl, 2,3-dimethylbutylaminocarbonyl, 3,3-dimethylbutylaminocarbonyl, 1-ethylbutylaminocarbonyl, 2-ethylbutylaminocarbonyl, 1,1,2-trimethylpropylaminocarbonyl, 1,2,2-trimethylpropylaminocarbonyl, 1-ethyl-1-methylpropylaminocarbonyl or 1-ethyl-2-methylpropylaminocarbonyl;

- di-(C_1-C_4-alkyl)aminocarbonyl: for example N,N-dimethylaminocarbonyl, N,N-diethylaminocarbonyl, N,N-di-(1-methylethyl)aminocarbonyl, N,N–dipropylaminocarbonyl, N,N-dibutylaminocarbonyl,

N,N-di-(1-methylpropyl)aminocarbonyl,
N,N-di-(2-methylpropyl)aminocarbonyl,
N,N-di-(1,1-dimethylethyl)aminocarbonyl,
N-ethyl-N-methylaminocarbonyl,
N-methyl-N-propylaminocarbonyl,
N-methyl-N-(1-methylethyl)aminocarbonyl,
N-butyl-N-methylaminocarbonyl,
N-methyl-N-(1-methylpropyl)aminocarbonyl,
N-methyl-N-(2-methylpropyl)aminocarbonyl,
N-(1,1-dimethylethyl)-N-methylaminocarbonyl,
N-ethyl-N-propylaminocarbonyl,
N-ethyl-N-(1-methylethyl)aminocarbonyl,
N-butyl-N-ethylaminocarbonyl,
N-ethyl-N-(1-methylpropyl)aminocarbonyl,
N-ethyl-N-(2-methylpropyl)aminocarbonyl,
N-ethyl-N-(1,1-dimethylethyl)aminocarbonyl,
N-(1-methylethyl)-N-propylaminocarbonyl,
N-butyl-N-propylaminocarbonyl,
N-(1-methylpropyl)-N-propylaminocarbonyl,
N-(2-methylpropyl)-N-propylaminocarbonyl,
N-(1,1-dimethylethyl)-N-propylaminocarbonyl,
N-butyl-N-(1-methylethyl)aminocarbonyl,
N-(1-methylethyl)-N-(1-methylpropyl)aminocarbonyl,
N-(1-methylethyl)-N-(2-methylpropyl)aminocarbonyl,
N-(1,1-dimethylethyl)-N-(1-methylethyl)aminocarbonyl,
N-butyl-N-(1-methylpropyl)aminocarbonyl,
N-butyl-N-(2-methylpropyl)aminocarbonyl,
N-butyl-N-(1,1-dimethylethyl)aminocarbonyl,
N-(1-methylpropyl)-N-(2-methylpropyl)aminocarbonyl,
N-(1,1-dimethylethyl)-N-(1-methylpropyl)aminocarbonyl or
N-(1,1-dimethylethyl)-N-(2-methylpropyl)aminocarbonyl;

- di-(C_1-C_6-alkyl)aminocarbonyl: di-(C_1-C_4-alkyl)aminocarbonyl, as mentioned above, and also, for example,
N-methyl-N-pentylaminocarbonyl,
N-methyl-N-(1-methylbutyl)aminocarbonyl,
N-methyl-N-(2-methylbutyl)aminocarbonyl,
N-methyl-N-(3-methylbutyl)aminocarbonyl, N-methyl-N-(2,2-dimethylpropyl)aminocarbonyl,
N-methyl-N-(1-ethylpropyl)aminocarbonyl,
N-methyl-N-hexylaminocarbonyl,
N-methyl-N-(1,1-dimethylpropyl)aminocarbonyl, N-methyl-N-(1,2-dimethylpropyl)aminocarbonyl,
N-methyl-N-(1-methylpentyl)aminocarbonyl,
N-methyl-N-(2-methylpentyl)aminocarbonyl,
N-methyl-N-(3-methylpentyl)aminocarbonyl,
N-methyl-N-(4-methylpentyl)aminocarbonyl, N-methyl-N-

(1,1-dimethylbutyl)aminocarbonyl,
N-methyl-N-(1,2-dimethylbutyl)aminocarbonyl,
N-methyl-N-(1,3-dimethylbutyl)aminocarbonyl,
N-methyl-N-(2,2-dimethylbutyl)aminocarbonyl,
N-methyl-N-(2,3-dimethylbutyl)aminocarbonyl, N-methyl-N-(3,3-dimethylbutyl)aminocarbonyl,
N-methyl-N-(1-ethylbutyl)aminocarbonyl,
N-methyl-N-(2-ethylbutyl)aminocarbonyl,
N-methyl-N-(1,1,2-trimethylpropyl)aminocarbonyl,
N-methyl-N-(1,2,2-trimethylpropyl)aminocarbonyl, N-methyl-N-(1-ethyl-1-methylpropyl)aminocarbonyl, N-methyl-N-(1-ethyl-2-methylpropyl)aminocarbonyl,
N-ethyl-N-pentylaminocarbonyl,
N-ethyl-N-(1-methylbutyl)aminocarbonyl, N-ethyl-N-(2-methylbutyl)aminocarbonyl,
N-ethyl-N-(3-methylbutyl)aminocarbonyl,
N-ethyl-N-(2,2-dimethylpropyl)aminocarbonyl,
N-ethyl-N-(1-ethylpropyl)aminocarbonyl,
N-ethyl-N-hexylaminocarbonyl,
N-ethyl-N-(1,1-dimethylpropyl)aminocarbonyl,
N-ethyl-N-(1,2-dimethylpropyl)aminocarbonyl,
N-ethyl-N-(1-methylpentyl)aminocarbonyl,
N-ethyl-N-(2-methylpentyl)aminocarbonyl,
N-ethyl-N-(3-methylpentyl)aminocarbonyl,
N-ethyl-N-(4-methylpentyl)aminocarbonyl,
N-ethyl-N-(1,1-dimethylbutyl)aminocarbonyl,
N-ethyl-N-(1,2-dimethylbutyl)aminocarbonyl,
N-ethyl-N-(1,3-dimethylbutyl)aminocarbonyl,
N-ethyl-N-(2,2-dimethylbutyl)aminocarbonyl, N-ethyl-N-(2,3-dimethylbutyl)aminocarbonyl,
N-ethyl-N-(3,3-dimethylbutyl)aminocarbonyl,
N-ethyl-N-(1-ethylbutyl)aminocarbonyl,
N-ethyl-N-(2-ethylbutyl)aminocarbonyl,
N-ethyl-N-(1,1,2-trimethylpropyl)aminocarbonyl,
N-ethyl-N-(1,2,2-trimethylpropyl)aminocarbonyl,
N-ethyl-N-(1-ethyl-1-methylpropyl)aminocarbonyl,
N-ethyl-N-(1-ethyl-2-methylpropyl)aminocarbonyl,
N-Propyl-N-pentylaminocarbonyl,
N-butyl-N-pentylaminocarbonyl, N,N-dipentylaminocarbonyl,
N-Propyl-N-hexylaminocarbonyl, N-butyl-N-hexylaminocarbonyl,
N-pentyl-N-hexylaminocarbonyl or N,N-dihexylaminocarbonyl;

- di-(C_1-C_6-alkyl)aminothiocarbonyl: for example
N,N-dimethylaminothiocarbonyl, N,N-diethylaminothiocarbonyl,
N,N-di-(1-methylethyl)aminothiocarbonyl,
N,N-dipropylaminothiocarbonyl, N,N-dibutylaminothiocarbonyl,
N,N-di-(1-methylpropyl)aminothiocarbonyl,

N,N-di-(2-methylpropyl)aminothiocarbonyl,
N,N-di-(1,1-dimethylethyl)aminothiocarbonyl,
N-ethyl-N-methylaminothiocarbonyl,
N-methyl-N-propylaminothiocarbonyl,
N-methyl-N-(1-methylethyl)aminothiocarbonyl,
N-butyl-N-methylaminothiocarbonyl,
N-methyl-N-(1-methylpropyl)aminothiocarbonyl,
N-methyl-N-(2-methylpropyl)aminothiocarbonyl,
N-(1,1-dimethylethyl)-N-methylaminothiocarbonyl,
N-ethyl-N-propylaminothiocarbonyl,
N-ethyl-N-(1-methylethyl)aminothiocarbonyl,
N-butyl-N-ethylaminothiocarbonyl,
N-ethyl-N-(1-methylpropyl)aminothiocarbonyl,
N-ethyl-N-(2-methylpropyl)-aminothiocarbonyl, N-ethyl-N-(1,1-dimethylethyl)-aminothiocarbonyl, N-(1-methylethyl)-N-propylaminothiocarbonyl, N-butyl-N-propylaminothiocarbonyl,
N-(1-methylpropyl)-N-propylaminothiocarbonyl,
N-(2-methylpropyl)-N-propylaminothiocarbonyl,
N-(1,1-dimethylethyl)-N-propylaminothiocarbonyl,
N-butyl-N-(1-methylethyl)aminothiocarbonyl,
N-(1-methylethyl)-N-(1-methylpropyl)aminothiocarbonyl,
N-(1-methylethyl)-N-(2-methylpropyl)aminothiocarbonyl,
N-(1,1-dimethylethyl)-N-(1-methylethyl)aminothiocarbonyl,
N-butyl-N-(1-methylpropyl)aminothiocarbonyl,
N-butyl-N-(2-methylpropyl)aminothiocarbonyl, N-butyl-N-(1,1-dimethylethyl)aminothiocarbonyl, N-(1-methylpropyl)-N-(2-methylpropyl)aminothiocarbonyl,
N-(1,1-dimethylethyl)-N-(1-methylpropyl)aminothiocarbonyl,
N-(1,1-dimethylethyl)-N-(2-methylpropyl)aminothiocarbonyl,
N-methyl-N-pentylaminothiocarbonyl,
N-methyl-N-(1-methylbutyl)aminothiocarbonyl,
N-methyl-N-(2-methylbutyl)aminothiocarbonyl,
N-methyl-N-(3-methylbutyl)aminothiocarbonyl, N-methyl-N-(2,2-dimethylpropyl)aminothiocarbonyl,
N-methyl-N-(1-ethylpropyl)aminothiocarbonyl,
N-methyl-N-hexylaminothiocarbonyl,
N-methyl-N-(1,1-dimethylpropyl)aminothiocarbonyl, N-methyl-N-(1,2-dimethylpropyl)aminothiocarbonyl, N-methyl-N-(1-methylpentyl)aminothiocarbonyl,
N-methyl-N-(2-methylpentyl)aminothiocarbonyl,
N-methyl-N-(3-methylpentyl)aminothiocarbonyl,
N-methyl-N-(4-methylpentyl)aminothiocarbonyl,
N-methyl-N-(1,1-dimethylbutyl)aminothiocarbonyl, N-methyl-N-(1,2-dimethylbutyl)aminothiocarbonyl,
N-methyl-N-(1,3-dimethylbutyl)aminothiocarbonyl,
N-methyl-N-(2,2-dimethylbutyl)aminothiocarbonyl,
N-methyl-N-(2,3-dimethylbutyl)aminothiocarbonyl,

N-methyl-N-(3,3-dimethylbutyl)aminothiocarbonyl, N-methyl-N-(1-ethylbutyl)aminothiocarbonyl, N-methyl-N-(2-ethylbutyl)aminothiocarbonyl, N-methyl-N-ethyl-N-(1,1,2-trimethylpropyl)aminothiocarbonyl, N-methyl-N-(1,2,2-trimethylpropyl)aminothiocarbonyl, N-methyl-N-(1-ethyl-1-methylpropyl)aminothiocarbonyl, N-methyl-N-(1-ethyl-2-methylpropyl)aminothiocarbonyl, N-ethyl-N-pentylaminothiocarbonyl, N-ethyl-N-(1-methylbutyl)aminothiocarbonyl, N-ethyl-N-(2-methylbutyl)aminothiocarbonyl, N-ethyl-N-(3-methylbutyl)aminothiocarbonyl, N-ethyl-N-(2,2-dimethylpropyl)aminothiocarbonyl, N-ethyl-N-(1-ethylpropyl)aminothiocarbonyl, N-ethyl-N-hexylaminothiocarbonyl, N-ethyl-N-(1,1-dimethylpropyl)aminothiocarbonyl, N-ethyl-N-(1,2-dimethylpropyl)aminothiocarbonyl, N-ethyl-N-(1-methylpentyl)aminothiocarbonyl, N-ethyl-N-(2-methylpentyl)aminothiocarbonyl, N-ethyl-N-(3-methylpentyl)aminothiocarbonyl, N-ethyl-N-(4-methylpentyl)aminothiocarbonyl, N-ethyl-N-(1,1-dimethylbutyl)aminothiocarbonyl, N-ethyl-N-(1,2-dimethylbutyl)aminothiocarbonyl, N-ethyl-N-(1,3-dimethylbutyl)aminothiocarbonyl, N-ethyl-N-(2,2-dimethylbutyl)aminothiocarbonyl, N-ethyl-N-(2,3-dimethylbutyl)aminothiocarbonyl, N-ethyl-N-(3,3-dimethylbutyl)aminothiocarbonyl, N-ethyl-N-(1-ethylbutyl)aminothiocarbonyl, N-ethyl-N-(2-ethylbutyl)aminothiocarbonyl, N-ethyl-N-(1,1,2-trimethylpropyl)aminothiocarbonyl, N-ethyl-N-(1,2,2-trimethylpropyl)aminothiocarbonyl, N-ethyl-N-(1-ethyl-1-methylpropyl)aminothiocarbonyl, N-ethyl-N-(1-ethyl-2-methylpropyl)aminothiocarbonyl, N-Propyl-N-pentylaminothiocarbonyl, N-butyl-N-pentylaminothiocarbonyl, N,N-dipentylaminothiocarbonyl, N-Propyl-N-hexylaminothiocarbonyl, N-butyl-N-hexylaminothiocarbonyl, N-pentyl-N-hexylaminothiocarbonyl or N,N-dihexylaminothiocarbonyl;

- C_1-C_4-alkoxy-C_1-C_4-alkyl: C_1-C_4-alkyl which is substituted by C_1-C_4-alkoxy as mentioned above, i.e., for example, methoxymethyl, ethoxymethyl, propoxymethyl, (1-methylethoxy)methyl, butoxymethyl, (1-methylpropoxy)methyl, (2-methylpropoxy)methyl, (1,1-dimethylethoxy)methyl, 2-(methoxy)ethyl, 2-(ethoxy)ethyl, 2-(propoxy)ethyl, 2-(1-methylethoxy)ethyl,

2-(butoxy)ethyl, 2-(1-methylpropoxy)ethyl, 2-(2-methylpropoxy)ethyl, 2-(1,1-dimethylethoxy)ethyl, 2-(methoxy)-propyl, 2-(ethoxy)propyl, 2-(propoxy)propyl, 2-(1-methylethoxy)propyl, 2-(butoxy)propyl, 2-(1-methylpropoxy)propyl, 2-(2-methylpropoxy)propyl, 2-(1,1-dimethylethoxy)propyl, 3-(methoxy)propyl, 3-(ethoxy)propyl, 3-(propoxy)propyl, 3-(1-methylethoxy)propyl, 3-(butoxy)propyl, 3-(1-methylpropoxy)propyl, 3-(2-methylpropoxy)propyl, 3-(1,1-dimethylethoxy)propyl, 2-(methoxy)butyl, 2-(ethoxy)butyl, 2-(propoxy)butyl, 2-(1-methylethoxy)butyl, 2-(butoxy)butyl, 2-(1-methylpropoxy)butyl, 2-(2-methylpropoxy)butyl, 2-(1,1-dimethylethoxy)butyl, 3-(methoxy)butyl, 3-(ethoxy)butyl, 3-(propoxy)butyl, 3-(1-methylethoxy)butyl, 3-(butoxy)butyl, 3-(1-methylpropoxy)butyl, 3-(2-methylpropoxy)butyl, 3-(1,1-dimethylethoxy)butyl, 4-(methoxy)butyl, 4-(ethoxy)-butyl, 4-(propoxy)butyl, 4-(1-methylethoxy)butyl, 4-(butoxy)butyl, 4-(1-methylpropoxy)butyl, 4-(2-methylpropoxy)butyl or 4-(1,1-dimethylethoxy)butyl;

- C_1-C_4-alkoxy-C_1-C_4-alkoxy, and the alkoxyalkoxy moieties of C_1-C_4-alkoxy-C_1-C_4-alkoxycarbonyl: C_1-C_4-alkoxy which is substituted by C_1-C_4-alkoxy as mentioned above, i.e., for example, methoxymethoxy, ethoxymethoxy, propoxymethoxy, (1-methylethoxy)methoxy, butoxymethoxy, (1-methylpropoxy)methoxy, (2-methylpropoxy)methoxy, (1,1-dimethylethoxy)methoxy, 2-(methoxy)ethoxy, 2-(ethoxy)ethoxy, 2-(propoxy)ethoxy, 2-(1-methylethoxy)ethoxy, 2-(butoxy)ethoxy, 2-(1-methylpropoxy)ethoxy, 2-(2-methylpropoxy)ethoxy, 2-(1,1-dimethylethoxy)ethoxy, 2-(methoxy)propoxy, 2-(ethoxy)propoxy, 2-(propoxy)propoxy, 2-(1-methylethoxy)propoxy, 2-(butoxy)propoxy, 2-(1-methylpropoxy)propoxy, 2-(2-methylpropoxy)propoxy, 2-(1,1-dimethylethoxy)propoxy, 3-(methoxy)propoxy, 3-(ethoxy)propoxy, 3-(propoxy)propoxy, 3-(1-methylethoxy)-propoxy, 3-(butoxy)propoxy, 3-(1-methylpropoxy)propoxy, 3-(2-methylpropoxy)propoxy, 3-(1,1-dimethylethoxy)propoxy, 2-(methoxy)butoxy, 2-(ethoxy)butoxy, 2-(propoxy)butoxy, 2-(1-methylethoxy)butoxy, 2-(butoxy)butoxy, 2-(1-methylpropoxy)butoxy, 2-(2-methylpropoxy)butoxy, 2-(1,1-dimethylethoxy)butoxy, 3-(methoxy)butoxy, 3-(ethoxy)butoxy, 3-(propoxy)butoxy, 3-(1-methylethoxy)butoxy, 3-(butoxy)butoxy, 3-(1-methylpropoxy)butoxy, 3-(2-methylpropoxy)butoxy, 3-(1,1-dimethylethoxy)butoxy, 4-(methoxy)butoxy,

4-(ethoxy)butoxy, 4-(propoxy)butoxy,
4-(1-methylethoxy)butoxy, 4-(butoxy)butoxy,
4-(1-methylpropoxy)butoxy, 4-(2-methylpropoxy)butoxy or
4-(1,1-dimethylethoxy)butoxy;

- C_3–C_6–alkenyl, and the alkenyl moieties of
C_3–C_6–alkenylcarbonyl, C_3-C_6-alkenyloxy,
C_3–C_6–alkenyloxycarbonyl, C_3–C_6–alkenylaminocarbonyl,
N–(C_3–C_6–alkenyl)–N–(C_1–C_6alkyl)aminocarbonyl,
N–(C_3–C_6–alkenyl)–N–(C_1–C_6–alkoxy)aminocarbonyl: for example
prop–2–en–1–yl, but–1–en–4–yl, 1–methyl–prop–2–en–1–yl,
2–methylprop–2–en–1–yl, 2–buten–1–yl, 1–penten–3–yl,
1–penten–4–yl, 2–penten–4–yl, 1–methylbut–2–en–1–yl,
2–methylbut–2–en–1–yl, 3–methylbut–2–en–1–yl,
1–methylbut–3–en–1–yl, 2–methylbut–3–en–1–yl,
3–methylbut–3–en–1–yl, 1,1–dimethylprop–2–en–1–yl,
1,2–dimethylprop–2–en–1–yl, 1–ethylprop–2–en–1–yl,
hex–3–en–1–yl, hex–4–en–1–yl, hex–5–en–1–yl,
1–methylpent–3–en–1–yl, 2–methylpent–3–en–1–yl,
3–methylpent–3–en–1–yl, 4–methylpent–3–en–1–yl,
1–methylpent–4–en–1–yl, 2–methylpent–4–en–1–yl,
3–methylpent–4–en–1–yl, 4–methylpent–4–en–1–yl,
1,1–dimethylbut–2–en–1–yl, 1,1–dimethylbut–3–en–1–yl,
1,2–dimethylbut–2–en–1–yl, 1,2–dimethylbut–3–en–1–yl,
1,3–dimethylbut–2–en–1–yl, 1,3–dimethylbut–3–en–1–yl,
2,2–dimethylbut–3–en–1–yl, 2,3–dimethylbut–2–en–1–yl,
2,3–dimethylbut–3–en–1–yl, 3,3–dimethylbut–2–en–1–yl,
1–ethylbut–2–en–1–yl, 1–ethylbut–3–en–1–yl,
2–ethylbut–2–en–1–yl, 2–ethylbut–3–en–1–yl,
1,1,2–trimethylprop–2–en–1–yl, 1–ethyl–1–methylprop–2–en–1–yl
or 1–ethyl–2–methylprop–2–en–1–yl;

C_2–C_6–alkenyl, and the alkenyl moieties of
C_2–C_6–alkenylcarbonyl, phenyl–C_2–C_6–alkenylcarbonyl and
heterocyclyl–C_2–C_6–alkenylcarbonyl: C_3–C_6–alkenyl as mentioned
above, and also ethenyl;

- C_3–C_6–haloalkenyl: a C_3–C_6–alkenyl radical as mentioned above
which is partially or fully substituted by fluorine,
chlorine, bromine and/or iodine, i.e., for example,
2–chloroallyl, 3–chloroallyl, 2,3–dichloroallyl,
3,3–dichloroallyl, 2,3,3–trichloroallyl,
2,3–dichlorobut–2–enyl, 2–bromoallyl, 3–bromoallyl,
2,3–dibromoallyl, 3,3–dibromoallyl, 2,3,3–tribromoallyl or
2,3–dibromobut–2–enyl;

- C_3–C_6–alkynyl, and the alkyinyl moieties of C_3–C_6–alkynylcarbonyl, C_3-C_6-alkynyloxy, C_3–C_6–alkynyloxycarbonyl, C_3–C_6–alkynylaminocarbonyl, N–(C_3–C_6–alkynyl)–N–(C_1–C_6–alkyl)aminocarbonyl, N–(C_3–C_6–alkynyl)–N–(C_1–C_6–alkoxyaminocarbonyl: for example propargyl, but–1–yn–3–yl, but–1–yn–4–yl, but–2–yn–1–yl, pent–1–yn–3–yl, pent–1–yn–4–yl, pent–1–yn–5–yl, pent–2–yn–1–yl, pent–2–yn–4–yl, pent–2–yn–5–yl, 3–methyl–but–1–yn–3–yl, 3–methylbut–1–yn–4–yl, hex–1–yn–3–yl, hex–1–yn–4–yl, hex–1–yn–5–yl, hex–1–yn–6–yl, hex–2–yn–1–yl, hex–2–yn–4–yl, hex–2–yn–5–yl, hex–2–yn–6–yl, hex–3–yn–1–yl, hex–3–yn–2–yl, 3–methylpent–1–yn–3–yl, 3–methylpent–1–yn–4–yl, 3–methylpent–1–yn–5–yl, 4–methylpent–2–yn–4–yl or 4–methylpent–2–yn–5–yl;

- C_2–C_6–alkynyl, and the alkynyl moieties of C_2–C_6–alkynylcarbonyl: C_3–C_6–alkynyl as mentioned above, and also ethynyl;

- C_3–C_6–haloalkynyl: a C_3–C_6–alkynyl radical as mentioned above which is partially or fully substitued by fluorine, chlorine, bromine and/or iodine, i.e., for example, 1,1–difluoroprop–2–yn–1–yl, 3–iodoprop–2–yn–1–yl, 4–fluorobut–2–yn–1–yl, 4–chlorobut–2–yn–1–yl, 1,1–difluorobut–2–yn–1–yl, 4–iodobut–3–yn–1–yl, 5–fluoropent–3–yn–1–yl, 5–iodopent–4–yn–1–yl, 6–fluorohex–4–yn–1–yl or 6–iodohex–5–yn–1–yl;

- C_3–C_6–cycloalkyl, and the cycloalkyl moieties of C_3–C_6-cycloalkylcarbonyl: for example cyclopropyl, cyclobutyl, cyclopentyl or cyclohexyl;

- heterocyclyl, and the heterocyclyl moieties of heterocyclylcarbonyl, heterocyclyl–C_1–C_6–alkyl, heterocyclyloxy, heterocyclylthio, heterocyclyloxyalkylcarbonyl, heterocyclyloxycarbonyl, heterocyclyloxythiocarbonyl, heterocyclylcarbonyl–C_1–C_6–alkyl, N–(C_1–C_6–alkyl)–N–(heterocyclyl)aminocarbonyl, heterocyclylaminocarbonyl: a saturated, partially saturated or unsaturated 5– or 6–membered heterocyclic ring which is attached via a carbon and has one to four identical or different hetero atoms selected from the following group: oxygen, sulfur or nitrogen, i.e., for example, 5–membered rings having a hetero atom such as, for example:

tetrahydrofuran-2-yl, tetrahydrofuran-3-yl, tetrahydrothien-2-yl, tetrahydrothien-3-yl, tetrahydropyrrol-2-yl, tetrahydropyrrol-3-yl, 2,3-dihydrofuran-2-yl, 2,3-dihydrofuran-3-yl, 2,5-dihydrofuran-2-yl, 2,5-dihydrofuran-3-yl, 4,5-dihydrofuran-2-yl, 4,5-dihydrofuran-3-yl, 2,3-dihydrothien-2-yl, 2,3-dihydrothien-3-yl, 2,5-dihydrothien-2-yl, 2,5-dihydrothien-3-yl, 4,5-dihydrothien-2-yl, 4,5-dihydrothien-3-yl, 2,3-dihydro-1H-pyrrol-2-yl, 2,3-dihydro-1H-pyrrol-3-yl, 2,5-dihydro-1H-pyrrol-2-yl, 2,5-dihydro-1H-pyrrol-3-yl, 4,5-dihydro-1H-pyrrol-2-yl, 4,5-dihydro-1H-pyrrol-3-yl, 3,4-dihydro-2H-pyrrol-2-yl, 3,4-dihydro-2H-pyrrol-3-yl, 3,4-dihydro-5H-pyrrol-2-yl, 3,4-dihydro-5H-pyrrol-3-yl, 2-furyl, 3-furyl, 2-thienyl, 3-thienyl, pyrrol-2-yl or pyrrol-3-yl;

5-membered rings having two hetero atoms such as, for example,

tetrahydropyrazol-3-yl, tetrahydropyrazol-3-yl, tetrahydropyrazol-4-yl, tetrahydroisoxazol-3-yl, tetrahydroisoxazol-4-yl, tetrahydroisoxazol-5-yl, 1,2-oxathiolan-3-yl, 1,2-oxathiolan-4-yl, 1,2-oxathiolan-5-yl, tetrahydroisothiazol-3-yl, tetrahydroisothiazol-4-yl, tetrahydroisothiazol-5-yl, 1,2-dithiolan-3-yl, 1,2-dithiolan-4-yl, tetrahydroimidazol-2-yl, tetrahydroimidazol-4-yl, tetrahydrooxazol-2-yl, tetrahydrooxazol-4-yl, tetrahydrooxazol-5-yl, tetrahydrothiazol-2-yl, tetrahydrothiazol-4-yl, tetrahydrothiazol-5-yl, 1,3-dioxolan-2-yl, 1,3-dioxolan-4-yl, 1,3-oxathiolan-2-yl, 1,3-oxathiolan-4-yl, 1,3-oxathiolan-5-yl, 1,3-dithiolan-2-yl, 1,3-dithiolan-4-yl, 4,5-dihydro-1H-pyrazol-3-yl, 4,5-dihydro-1H-pyrazol-4-yl, 4,5-dihydro-1H-pyrazol-5-yl, 2,5-dihydro-1H-pyrazol-3-yl, 2,5-dihydro-1H-pyrazol-4-yl, 2,5-dihydro-1H-pyrazol-5-yl, 4,5-dihydroisoxazol-3-yl, 4,5-dihydroisoxazol-4-yl, 4,5-dihydroisoxazol-5-yl, 2,5-dihydroisoxazol-3-yl, 2,5-dihydroisoxazol-4-yl, 2,5-dihydroisoxazol-5-yl, 2,3-dihydroisoxazol-3-yl, 2,3-dihydroisoxazol-4-yl, 2,3-dihydroisoxazol-5-yl, 4,5-dihydroisothiazol-3-yl, 4,5-dihydroisothiazol-4-yl, 4,5-dihydroisothiazol-5-yl, 2,5-dihydroisothiazol-3-yl, 2,5-dihydroisothiazol-4-yl, 2,5-dihydroisothiazol-5-yl, 2,3-dihydroisothiazol-3-yl, 2,3-dihydroisothiazol-4-yl, 2,3-dihydroisothiazol-5-yl, Δ^3-1,2-dithiol-3-yl, Δ^3-1,2-dithiol-4-yl, Δ^3-1,2-dithiol-5-yl, 4,5-dihydro-1H-imidazol-2-yl,

4,5-dihydro-1H-imidazol-4-yl, 4,5-dihydro-1H-imidazol-5-yl, 2,5-dihydro-1H-imidazol-2-yl, 2,5-dihydro-1H-imidazol-4-yl, 2,5-dihydro-1H-imidazol-5-yl, 2,3-dihydro-1H-imidazol-2-yl, 2,3-dihydro-1H-imidazol-4-yl, 4,5-dihydrooxazol-2-yl, 4,5-dihydrooxazol-4-yl, 4,5-dihydrooxazol-5-yl, 2,5-dihydrooxazol-2-yl, 2,5-dihydrooxazol-4-yl, 2,5-dihydrooxazol-5-yl, 2,3-dihydrooxazol-2-yl, 2,3-dihydrooxazol-4-yl, 2,3-dihydrooxazol-5-yl, 4,5-dihydrothiazol-2-yl, 4,5-dihydrothiazol-4-yl, 4,5-dihydrothiazol-5-yl, 2,5-dihydrothiazol-2-yl, 2,5-dihydrothiazol-4-yl, 2,5-dihydrothiazol-5-yl, 2,3-dihydrothiazol-2-yl, 2,3-dihydrothiazol-4-yl, 2,3-dihydrothiazol-5-yl, 1,3-dioxol-2-yl, 1,3-dioxol-4-yl, 1,3-dithiol-2-yl, 1,3-dithiol-4-yl, 1,3-oxathiol-2-yl, 1,3-oxathiol-4-yl, 1,3-oxathiol-5-yl, pyrazol-3-yl, pyrazol-4-yl, isoxazol-3-yl, isoxazol-4-yl, isoxazol-5-yl, isothiazol-3-yl, isothiazol-4-yl, isothiazol-5-yl, imidazol-2-yl, imidazol-4-yl, oxazol-2-yl, oxazol-4-yl, oxazol-5-yl, thiazol-2-yl, thiazol-4-yl or thiazol-5-yl;

5-membered rings having 3 hetero atoms such as, for example, 1,2,3-Δ^2-oxadiazolin-4-yl, 1,2,3-Δ^2-oxadiazolin-5-yl, 1,2,4-Δ^4-oxadiazolin-3-yl, 1,2,4-Δ^4-oxadiazolin-5-yl, 1,2,4-Δ^2-oxadiazolin-3-yl, 1,2,4-Δ^2-oxadiazolin-5-yl, 1,2,4-Δ^3-oxadiazolin-3-yl, 1,2,4-Δ^3-oxadiazolin-5-yl, 1,3,4-Δ^2-oxadiazolin-2-yl, 1,3,4-Δ^2-oxadiazolin-5-yl, 1,3,4-Δ^3-oxadiazolin-2-yl, 1,3,4-oxadiazolin-2-yl, 1,2,4-Δ^4-thiadiazolin-3-yl, 1,2,4-Δ^4-thiadiazolin-5-yl, 1,2,4-Δ^3-thiadiazolin-3-yl, 1,2,4-Δ^3-thiadiazolin-5-yl, 1,2,4-Δ^2-thiadiazolin-3-yl, 1,2,4-Δ^2-thiadiazolin-5-yl, 1,3,4-Δ^2-thiadiazolin-2-yl, 1,3,4-Δ^2-thiadiazolin-5-yl, 1,3,4-Δ^3-thiadiazolin-2-yl, 1,3,4-thiadiazolin-2-yl, 1,3,2-dioxathiolan-4-yl, 1,2,3-Δ^2-triazolin-4-yl, 1,2,3-Δ^2-triazolin-5-yl, 1,2,4-Δ^2-triazolin-3-yl, 1,2,4-Δ^2-triazolin-5-yl, 1,2,4-Δ^3-triazolin-3-yl, 1,2,4-Δ^3-triazolin-5-yl, 1,2,4-Δ^1-triazolin-2-yl, 1,2,4-triazolin-3-yl, 3H-1,2,4-dithiazol-5-yl, 2H-1,3,4-dithiazol-5-yl, 2H-1,3,4-oxathiazol-5-yl, 1,2,3-oxadiazol-4-yl, 1,2,3-oxadiazol-5-yl, 1,2,4-oxadiazol-3-yl, 1,2,4,-oxadiazol-5-yl, 1,3,4-oxadiazol-2-yl, 1,2,3-thiadiazol-4-yl, 1,2,3-thiadiazol-5-yl, 1,2,4-thiadiazol-3-yl, 1,2,4-thiadiazol-5-yl, 1,3,4-thiadiazolyl-2-yl, 1,2,3-triazol-4-yl or 1,2,4-triazol-3-yl;

5-m mbered rings having 4 hetero atoms such as, for example,

tetrazol-5-yl,

6-membered rings having 1 hetero atom such as, for example:

tetrahydropyran-2-yl, tetrahydropyran-3-yl, tetrahydropyran-4-yl, piperidin-2-yl, piperidin-3-yl, piperidin-4-yl, tetrahydrothiopyran-2-yl, tetrahydrothiopyran-3-yl, tetrahydrothiopyran-4-yl, 2H-3,4-dihydropyran-6-yl, 2H-3,4-dihydropyran-5-yl, 2H-3,4-dihydropyran-4-yl, 2H-3,4-dihydropyran-3-yl, 2H-3,4-dihydropyran-2-yl, 2H-3,4-dihydropyran-6-yl, 2H-3,4-dihydrothiopyran-5-yl, 2H-3,4-dihydrothiopyran-4-yl, 2H-3,4-dihydropyran-3-yl, 2H-3,4-dihydropyran-2-yl, 1,2,3,4-tetrahydropyridin-6-yl, 1,2,3,4-tetrahydropyridin-5-yl, 1,2,3,4-tetrahydropyridin-4-yl, 1,2,3,4-tetrahydropyridin-3-yl, 1,2,3,4-tetrahydropyridin-2-yl, 2H-5,6-dihydropyran-2-yl, 2H-5,6-dihydropyran-3-yl, 2H-5,6-dihydropyran-4-yl, 2H-5,6-dihydropyran-5-yl, 2H-5,6-dihydropyran-6-yl, 2H-5,6-dihydrothiopyran-2-yl, 2H-5,6-dihydrothiopyran-3-yl, 2H-5,6-dihydrothiopyran-4-yl, 2H-5,6-dihydrothiopyran-5-yl, 2H-5,6-dihydrothiopyran-6-yl, 1,2,5,6-tetrahydropyridin-2-yl, 1,2,5,6-tetrahydropyridin-3-yl, 1,2,5,6-tetrahydropyridin-4-yl, 1,2,5,6-tetrahydropyridin-5-yl, 1,2,5,6-tetrahydropyridin-6-yl, 2,3,4,5-tetrahydropyridin-2-yl, 2,3,4,5-tetrahydropyridin-3-yl, 2,3,4,5-tetrahydropyridin-4-yl, 2,3,4,5-tetrahydropyridin-5-yl, 2,3,4,5-tetrahydropyridin-6-yl, 4H-pyran-2-yl, 4H-pyran-3-yl, 4H-pyran-4-yl, 4H-thiopyran-2-yl, 4H-thiopyran-3-yl, 4H-thiopyran-4-yl, 1,4-dihydropyridin-2-yl, 1,4-dihydropyridin-3-yl, 1,4-dihydropyridin-4-yl, 2H-pyran-2-yl, 2H-pyran-3-yl, 2H-pyran-4-yl, 2H-pyran-5-yl, 2H-pyran-6-yl, 2H-thiopyran-2-yl, 2H-thiopyran-3-yl, 2H-thiopyran-4-yl, 2H-thiopyran-5-yl, 2H-thiopyran-6-yl, 1,2-dihydropyridin-2-yl, 1,2-dihydropyridin-3-yl, 1,2-dihydropyridin-4-yl, 1,2-dihydropyridin-5-yl, 1,2-dihydropyridin-6-yl, 3,4-dihydropyridin-2-yl, 3,4-dihydropyridin-3-yl, 3,4-dihydropyridin-4-yl, 3,4-dihydropyridin-5-yl, 3,4-dihydropyridin-6-yl, 2,5-dihydropyridin-2-yl, 2,5-dihydropyridin-3-yl, 2,5-dihydropyridin-4-yl, 2,5-dihydropyridin-5-yl, 2,5-dihydropyridin-6-yl, 2,3-dihydropyridin-2-yl, 2,3-dihydropyridin-3-yl, 2,3-dihydropyridin-4-yl, 2,3-dihydropyridin-5-yl, 2,3-dihydropyridin-6-yl, pyridin-2-yl, pyridin-3-yl or pyridin-4-yl;

6-membered rings having 2 hetero atoms such as, for example,

1,3-dioxan-2-yl, 1,3-dioxan-4-yl, 1,3-dioxan-5-yl, 1,4-dioxan-2-yl, 1,3-dithian-2-yl, 1,3-dithian-4-yl, 1,3-dithian-5-yl, 1,4-dithian-2-yl, 1,3-oxathian-2-yl, 1,3-oxathian-4-yl, 1,3-oxathian-5-yl, 1,3-oxathian-6-yl, 1,4-oxathian-2-yl, 1,4-oxathian-3-yl, 1,2-dithian-3-yl, 1,2-dithian-4-yl, hexahydropyrimidin-2-yl, hexahydropyrimidin-4-yl, hexahydropyrimidin-5-yl, hexahydropyrazin-2-yl, hexahydropyridazin-3-yl, hexahydropyridazin-4-yl, tetrahydro-1,3-oxazin-2-yl, tetrahydro-1,3-oxazin-4-yl, tetrahydro-1,3-oxazin-5-yl, tetrahydro-1,3-oxazin-6-yl, tetrahydro-1,3-thiazin-2-yl, tetrahydro-1,3-thiazin-4-yl, tetrahydro-1,3-thiazin-5-yl, tetrahydro-1,3-thiazin-6-yl, tetrahydro-1,4-thiazin-2-yl, tetrahydro-1,4-thiazin-3-yl, tetrahydro-1,4-oxazin-2-yl, tetrahydro-1,4-oxazin-3-yl, tetrahydro-1,2-oxazin-3-yl, tetrahydro-1,2-oxazin-4-yl, tetrahydro-1,2-oxazin-5-yl, tetrahydro-1,2-oxazin-6-yl, 2H-5,6-dihydro-1,2-oxazin-3-yl, 2H-5,6-dihydro-1,2-oxazin-4-yl, 2H-5,6-dihydro-1,2-oxazin-5-yl, 2H-5,6-dihydro-1,2-oxazin-6-yl, 2H-5,6-dihydro-1,2-thiazin-3-yl, 2H-5,6-dihydro-1,2-thiazin-4-yl, 2H-5,6-dihydro-1,2-thiazin-5-yl, 2H-5,6-dihydro-1,2-thiazin-6-yl, 4H-5,6-dihydro-1,2-oxazin-3-yl, 4H-5,6-dihydro-1,2-oxazin-4-yl, 4H-5,6-dihydro-1,2-oxazin-5-yl, 4H-5,6-dihydro-1,2-oxazin-6-yl, 4H-5,6-dihydro-1,2-thiazin-3-yl, 4H-5,6-dihydro-1,2-thiazin-4-yl, 4H-5,6-dihydro-1,2-thiazin-5-yl, 4H-5,6-dihydro-1,2-thiazin-6-yl, 2H-3,6-dihydro-1,2-oxazin-3-yl, 2H-3,6-dihydro-1,2-oxazin-4-yl, 2H-3,6-dihydro-1,2-oxazin-5-yl, 2H-3,6-dihydro-1,2-oxazin-6-yl, 2H-3,6-dihydro-1,2-thiazin-3-yl, 2H-3,6-dihydro-1,2-thiazin-4-yl, 2H-3,6-dihydro-1,2-thiazin-5-yl, 2H-3,6-dihydro-1,2-thiazin-6-yl, 2H-3,4-dihydro-1,2-oxazin-3-yl, 2H-3,4-dihydro-1,2-oxazin-4-yl, 2H-3,4-dihydro-1,2-oxazin-5-yl, 2H-3,4-dihydro-1,2-oxazin-6-yl, 2H-3,4-dihydro-1,2-thiazin-3-yl, 2H-3,4-dihydro-1,2-thiazin-4-yl, 2H-3,4-dihydro-1,2-thiazin-5-yl, 2H-3,4-dihydro-1,2-thiazin-6-yl, 2,3,4,5-tetrahydropyridazin-3-yl, 2,3,4,5-tetrahydropyridazin-4-yl, 2,3,4,5-tetrahydropyridazin-5-yl, 2,3,4,5-tetrahydropyridazin-6-yl, 3,4,5,6-tetrahydropyridazin-3-yl, 3,4,5,6-tetrahydropyridazin-4-yl, 1,2,5,6-tetrahydropyridazin-3-yl,

1,2,5,6-tetrahydropyridazin-4-yl,
1,2,5,6-tetrahydropyridazin-5-yl,
1,2,5,6-tetrahydropyridazin-6-yl,
1,2,3,6-tetrahydropyridazin-3-yl,
1,2,3,6-tetrahydropyridazin-4-yl,
4H-5,6-dihydro-1,3-oxazin-2-yl,
4H-5,6-dihydro-1,3-oxazin-4-yl,
4H-5,6-dihydro-1,3-oxazin-5-yl,
4H-5,6-dihydro-1,3-oxazin-6-yl,
4H-5,6-dihydro-1,3-thiazin-2-yl,
4H-5,6-dihydro-1,3-thiazin-4-yl,
4H-5,6-dihydro-1,3-thiazin-5-yl, 4H-5,6-dihydro-1,3-thiazin-6-yl, 3,4,5-6-tetrahydropyrimidin-2-yl, 3,4,5,6-tetrahydropyrimidin-4-yl, 3,4,5,6-tetrahydropyrimidin-5-yl, 3,4,5,6-tetrahydropyrimidin-6-yl, 1,2,3,4-tetrahydropyrazin-2-yl, 1,2,3,4-tetrahydropyrazin-5-yl, 1,2,3,4-tetrahydropyrimidin-2-yl, 1,2,3,4-tetrahydropyrimidin-4-yl, 1,2,3,4-tetrahydropyrimidin-5-yl, 1,2,3,4-tetrahydropyrimidin-6-yl, 2,3-dihydro-1,4-thiazin-2-yl, 2,3-dihydro-1,4-thiazin-3-yl, 2,3-dihydro-1,4-thiazin-5-yl, 2,3-dihydro-1,4-thiazin-6-yl, 2H-1,2-oxazin-3-yl, 2H-1,2-oxazin-4-yl, 2H-1,2-oxazin-5-yl, 2H-1,2-oxazin-6-yl, 2H-1,2-thiazin-3-yl, 2H-1,2-thiazin-4-yl, 2H-1,2-thiazin-5-yl, 2H-1,2-thiazin-6-yl, 4H-1,2-oxazin-3-yl, 4H-1,2-oxazin-4-yl, 4H-1,2-oxazin-5-yl, 4H-1,2-oxazin-6-yl, 4H-1,2-thiazin-3-yl, 4H-1,2-thiazin-4-yl, 4H-1,2-thiazin-5-yl, 4H-1,2-thiazin-6-yl, 6H-1,2-oxazin-3-yl, 6H-1,2-oxazin-4-yl, 6H-1,2-oxazin-5-yl, 6H-1,2-oxazin-6-yl, 6H-1,2-thiazin-3-yl, 6H-1,2-thiazin-4-yl, 6H-1,2-thiazin-5-yl, 6H-1,2-thiazin-6-yl, 2H-1,3-oxazin-2-yl, 2H-1,3-oxazin-4-yl, 2H-1,3-oxazin-5-yl, 2H-1,3-oxazin-6-yl, 2H-1,3-thiazin-2-yl, 2H-1,3-thiazin-4-yl, 2H-1,3-thiazin-5-yl, 2H-1,3-thiazin-6-yl, 4H-1,3-oxazin-2-yl, 4H-1,3-oxazin-4-yl, 4H-1,3-oxazin-5-yl, 4H-1,3-oxazin-6-yl, 4H-1,3-thiazin-2-yl, 4H-1,3-thiazin-4-yl, 4H-1,3-thiazin-5-yl, 4H-1,3-thiazin-6-yl, 6H-1,3-oxazin-2-yl, 6H-1,3-oxazin-4-yl, 6H-1,3-oxazin-5-yl, 6H-1,3-oxazin-6-yl, 6H-1,3-thiazin-2-yl, 6H-1,3-oxazin-4-yl, 6H-1,3-oxazin-5-yl, 6H-1,3-thiazin-6-yl, 2H-1,4-oxazin-2-yl, 2H-1,4-oxazin-3-yl, 2H-1,4-oxazin-5-yl, 2H-1,4-oxazin-6-yl, 2H-1,4-thiazin-2-yl, 2H-1,4-thiazin-3-yl, 2H-1,4-thiazin-5-yl, 2H-1,4-thiazin-6-yl, 4H-1,4-oxazin-2-yl, 4H-1,4-oxazin-3-yl, 4H-1,4-thiazin-2-yl, 4H-1,4-thiazin-3-yl, 1,4-dihydropyridazin-3-yl, 1,4-dihydropyridazin-4-yl, 1,4-dihydropyridazin-5-yl, 1,4-dihydropyridazin-6-yl, 1,4-dihydropyrazin-2-yl, 1,2-dihydropyrazin-2-yl, 1,2-dihydropyrazin-3-yl, 1,2-dihydropyrazin-5-yl, 1,2-dihydropyrazin-6-yl, 1,4-dihydropyrimidin-2-yl,

1,4–dihydropyrimidin–4–yl, 1,4–dihydropyrimidin–5–yl, 1,4–dihydropyrimidin–6–yl, 3,4–dihydropyrimidin–2–yl, 3,4–dihydropyrimidin–4–yl, 3,4–dihydropyrimidin–5–yl or 3,4–dihydropyrimidin–6–yl, pyridazin–3–yl, pyridazin–4–yl, pyrimidin–2–yl, pyrimidin–4–yl, pyrimidin–5–yl or pyrazin–2–yl;

6-membered rings having 3 hetero atoms such as, for example,

1,3,5–triazin–2–yl, 1,2,4–triazin–3–yl, 1,2,4–triazin–5–yl or 1,2,4–triazin–6–yl;

6-membered rings having 4 hetero atoms such as, for example,

1,2,4,5–tetrazin–3–yl;

where, if appropriate, the sulfur of the abovementioned heterocycles may be oxidized to S=O or $S(=O)_2$;

and where a bicyclic ring system may be formed with a fused-on phenyl ring or with a C_3–C_6–carbocycle or with another 5– to 6–membered heterocycle.

- N-linked heterocyclyl: a saturated, partially saturated or unsaturated 5- or 6-membered heterocyclic ring which is attached via nitrogen and which contains at least one nitrogen and optionally one to three identical or different hetero atoms selected from the following group: oxygen, sulfur or nitrogen, i.e., for example,

5-membered rings having 1 hetero atom which are linked by a nitrogen, such as, for example,

tetrahydropyrrol–1–yl, 2,3–dihydro–1H–pyrrol–1–yl, 2,5–dihydro–1H–pyrrol–1–yl or pyrrol–1–yl;

5-membered rings having 2 hetero atoms which are linked by a nitrogen such as, for example,

tetrahydropyrazol–1–yl, tetrahydroisoxazol–2–yl, tetrahydroisothiazol–2–yl, tetrahydroimidazol–1–yl, tetrahydrooxazol–3–yl, tetrahydrothiazol–3–yl, 4,5–dihydro–1H–pyrazol–1–yl, 2,5–dihydro–1H–pyrazol–1–yl, 2,3–dihydro–1H–pyrazol–1–yl, 2,5–dihydroisoxazol–2–yl, 2,3–dihydroisoxazol–2–yl, 2,5–dihydroisothiazol–2–yl,

2,3-dihydroisoxazol-2-yl, 4,5-dihydro-1H-imidazol-1-yl, 2,5-dihydro-1H-imidazol-1-yl, 2,3-dihydro-1H-imidazol-1-yl, 2,3-dihydrooxazol-3-yl, 2,3-dihydrothiazol-3-yl, pyrazol-1-yl or imidazol-1-yl;

5-membered rings having 3 hetero atoms which are linked by a nitrogen such as, for example,

1,2,4-Δ^4-oxadiazolin-2-yl, 1,2,4-Δ^2-oxadiazolin-4-yl, 1,2,4-Δ^3-oxadiazolin-2-yl, 1,3,4-Δ^2-oxadiazolin-4-yl, 1,2,4-Δ^5-thiadiazolin-2-yl, 1,2,4-Δ^3-thiadiazolin-2-yl, 1,2,4-Δ^2-thiadiazolin-4-yl, 1,3,4-Δ^2-thiadiazolin-4-yl, 1,2,3-Δ^2-triazolin-1-yl, 1,2,4-Δ^2-triazolin-1-yl, 1,2,4-Δ^2-triazolin-4-yl, 1,2,4-Δ^3-triazolin-1-yl, 1,2,4-Δ^1-triazolin-4-yl, 1,2,3-triazol-1-yl or 1,2,4-triazol-1-yl;

5-membered rings having 4 hetero atoms which are linked by a nitrogen such as, for example,

tetrazol-1-yl;

and 6-membered rings having 1 hetero atom which are linked by a nitrogen, such as, for example

piperidin-1-yl, 1,2,3,4-tetrahydropyridin-1-yl, 1,2,5,6-tetrahydropyridin-1-yl, 1,4-dihydropyridin-1-yl or 1,2-dihydropyridin-1-yl;

6-membered rings having 2 hetero atoms which are linked by a nitrogen such as, for example,

hexahydropyrimidin-1-yl, hexahydropyrazin-1-yl, hexahydropyridazin-1-yl, tetrahydro-1,3-oxazin-3-yl, tetrahydro-1,3-thiazin-3-yl, tetrahydro-1,4-thiazin-4-yl, tetrahydro-1,4-oxazin-4-yl, tetrahydro-1,2-oxazin-2-yl, 2H-5,6-dihydro-1,2-oxazin-2-yl, 2H-5,6-dihydro-1,2-thiazin-2-yl, 2H-3,6-dihydro-1,2-oxazin-2-yl, 2H-3,6-dihydro-1,2-thiazin-oxazin-2-yl, 2H-3,4-dihydro-1,2-thiazin-2-yl, 2,3,4,5-tetrahydropyridazin-2-yl, 1,2,5,6-tetrahydropyridazin-1-yl, 1,2,5,6-tetrahydropyridazin-2-yl, 1,2,3,6-tetrahydropyridazin-1-yl, 3,4,5,6-tetrahydropyrimidin-3-yl, 1,2,3,4-tetrahydropyrazin-1-yl, 1,2,3,4-tetrahydropyrimidin-1-yl, 1,2,3,4-tetrahydropyrimidin-3-yl, 2,3-dihydro-1,4-thiazin-4-yl, 2H-1,2-oxazin-2-yl,

2H-1,2-thiazin-2-yl, 4H-1,4-oxazin-4-yl, 4H-1,4-thiazin-4-yl, 1,4-dihydropyridazin-1-yl, 1,4-dihydropyrazin-1-yl, 1,2-dihydropyrazin-1-yl, 1,4-dihydropyrimidin-1-yl or 3,4-dihydropyrimidin-3-yl, and also cyclic imides which are linked via nitrogen, such as: phthalimide, tetrahydrophthalimide, succinimide, maleimide or glutarimide, and also 4-oxo-1,4-dihydropyridin-1-yl.

All phenyl rings or heterocyclyl radicals, and also all phenyl components in phenyl-C_1-C_6-alkyl, phenylcarbonyl-C_1-C_6-alkyl, phenoxy, phenylthio, phenylcarbonyl, phenylalkenylcarbonyl, phenoxycarbonyl, phenoxyalkylcarbonyl, phenylaminocarbonyl and N-(C_1-C_6-alkyl)-N-phenylaminocarbonyl or heterocyclyl components in heterocyclyl-C_1-C_6-alkyl, heterocyclylcarbonyl-C_1-C_6-alkyl, heterocyclyloxy, heterocyclylthio, heterocyclylcarbonyl, heterocyclylalkenylcarbonyl, heterocyclyloxyalkylcarbonyl, heterocyclyloxycarbonyl, heterocyclylaminocarbonyl and N-(C_1-C_6-alkyl)-N-heterocyclylaminocarbonyl are, unless stated otherwise, preferably unsubstituted, or they carry one to three halogen atoms and/or one nitro group, one cyano radical and/or one or two methyl, trifluoromethyl, methoxy or trifluoromethoxy substituents.

The compounds of the formula I according to the invention where R^4 = IIa are referred to as compounds of the formula Ia, and compounds of the formula I where R^4 = IIb are referred to as Ib.

The compounds of the formula I should be particularly emphasized, where

R^7 is C_1-C_6-alkyl, C_3-C_6-alkenyl, C_3-C_6-haloalkenyl, C_3-C_6-alkynyl, C_3-C_6-haloalkynyl, C_3-C_6-cycloalkyl, C_1-C_{20}-alkylcarbonyl, C_2-C_6-alkenylcarbonyl, C_2-C_6-alkynylcarbonyl, C_3-C_6-cycloalkylcarbonyl, C_1-C_6-alkoxycarbonyl, C_3-C_6-alkenyloxycarbonyl, C_3-C_6-alkynyloxycarbonyl, C_1-C_6-alkylthiocarbonyl, C_1-C_6-alkylaminocarbonyl, C_3-C_6-alkenylaminocarbonyl, C_3-C_6-alkynylaminocarbonyl, N,N-di-(C_1-C_6-alkyl)-aminocarbonyl, N-(C_3-C_6-alkenyl)-N-(C_1-C_6-alkyl)-aminocarbonyl, N-(C_3-C_6-alkynyl)-N-(C_1-C_6-alkyl)-aminocarbonyl, N-(C_1-C_6-alkoxy)-N-(C_1-C_6-alkyl)-aminocarbonyl, N-(C_3-C_6-alkenyl)-N-(C_1-C_6-alkoxy)-aminocarbonyl, N-(C_3-C_6-alkynyl)-N-(C_1-C_6-alkoxy)-aminocarbonyl, di-(C_1-C_6-alkyl)aminothiocarbonyl, C_1-C_6-alkylcarbonyl-C_1-C_6-alkyl, C_1-C_6-alkoxyimino-C_1-C_6-alkyl, N-(C_1-C_6-alkylamino)imino-C_1-C_6-alkyl or N,N-di-(C_1-C_6-alkylamino)imino-C_1-C_6-alkyl, where the

alkyl, cycloalkyl and alkoxy radicals mentioned may be partially or fully halogenated and/or may carry one to thre of the following groups:
cyano, C_1–C_4–alkoxy, C_1–C_4–alkylthio, di–(C_1–C_4–alkyl)–amino, C_1–C_4–alkylcarbonyl, C_1–C_4–alkoxycarbonyl, C_1–C_4–alkoxy–C_1–C_4–alkoxycarbonyl, di–(C_1–C_4–alkyl)–amino–C_1–C_4–alkoxycarbonyl, hydroxycarbonyl, C_1–C_4–alkylaminocarbonyl, di–(C_1–C_4–alkyl)aminocarbonyl, aminocarbonyl, C_1–C_4–alkylcarbonyloxy or C_3–C_6–cycloalkyl;

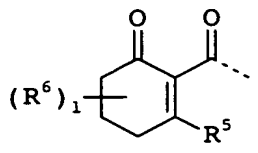
phenyl, heterocyclyl, phenyl–C_1–C_6–alkyl, heterocyclyl–C_1–C_6–alkyl, phenylcarbonyl–C_1–C_6–alkyl, heterocyclyl-carbonyl–C_1–C_6–alkyl, phenylcarbonyl, heterocyclyl-carbonyl, phenoxycarbonyl, heterocyclyloxycarbonyl, phenoxythiocarbonyl, heterocyclyloxythiocarbonyl, phenoxy-C_1-C_6-alkylcarbonyl, heterocyclyloxy-C_1-C_6-alkylcarbonyl, phenylaminocarbonyl, N–(C_1–C_6–alkyl)–N–(phenyl)aminocarbonyl, heterocyclylaminocarbonyl, N–(C_1–C_6–alkyl)–N–(heterocyclyl)aminocarbonyl, phenyl–C_2–C_6–alkenylcarbonyl or heterocyclyl–C_2–C_6–alkenylcarbonyl, where the phenyl and the heterocyclyl radical of the 20 last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:
nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

With a view to the use of the compounds of the formula I according to the invention as herbicides, the variables preferably have the following meanings, in each case on their own or in combination:

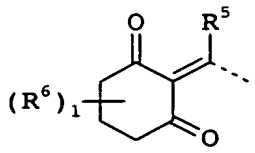
R^1 is nitro, halogen, C_1–C_6–alkyl, C_1–C_6–haloalkyl, C_1–C_6–alkoxy, C_1–C_6–haloalkoxy, C_1–C_6–alkylthio, C_1–C_6–haloalkylthio, C_1–C_6–alkylsulfonyl or C_1–C_6–haloalkylsulfonyl;

R^2, R^3 are hydrogen, C_1-C_6-alkyl or halogen;

R^4 is a compound of IIa or IIb



IIa



IIb

where

R^5 is halogen, OR^7, SR^7, SO_2R^8, OSO_2R^8, $OPOR^8R^9$, OPR^8R^9, $OPSR^8R^9$, $NR^{10}R^{11}$, $ONR^{11}R^{12}$, N-linked heterocyclyl or O-(N-linked heterocyclyl), where the heterocyclyl radical of the two last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

R^6 is halogen, cyano, C_1–C_6–alkyl, C_1–C_6–haloalkyl, di-(C_1-C_6-alkoxy)methyl, di-(C_1-C_6-alkylthio)methyl, (C_1-C_6-alkoxy)(C_1-C_6-alkylthio)methyl, hydroxyl, C_1–C_6–alkoxy, C_1–C_6–haloalkoxy, C_1-C_6-alkoxycarbonyloxy, C_1–C_6–alkylthio, C_1–C_6–haloalkylthio, C_1–C_6–alkylsulfonyl, C_1–C_6–haloalkylsulfonyl, C_1–C_6–alkylcarbonyl, C_1–C_6–haloalkylcarbonyl, C_1–C_6–alkoxycarbonyl or C_1–C_6–haloalkoxycarbonyl;

or

two radicals R^6, which are linked to the same carbon, together form an -O-$(CH_2)_m$-O-, -O-$(CH_2)_m$-S-, -S-$(CH_2)_m$-S-, -O-$(CH_2)_n$- or -S-$(CH_2)_n$-chain which may be substituted by one to three radicals from the following group:

halogen, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl or C_1-C_4-alkoxycarbonyl;

or

two radicals R^6, which are linked to the same carbon, together form a -$(CH_2)_p$ chain which may be interrupted by oxygen or sulfur and/or may be substituted by one to four radicals from the following group:

halogen, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl or C_1-C_4-alkoxycarbonyl;

or

two radicals R^6, which are linked to the same carbon, together with this carbon form a carbonyl group;

or

two radicals R^6, which are linked to different carbons, together form a $-(CH_2)_n$ chain which may be substituted by one to three radicals from the following group:

halogen, C_1-C_6-alkyl, C_1-C_6-alkoxy, hydroxyl or C_1-C_6-alkoxycarbonyl;

R^7 is C_1–C_6–alkyl, C_3–C_6–alkenyl, C_3–C_6–haloalkenyl, C_3–C_6–alkynyl, C_1–C_{20}–alkylcarbonyl, C_2–C_6–alkenylcarbonyl, C_3–C_6–cycloalkylcarbonyl, C_1–C_6–alkoxycarbonyl, C_3–C_6–alkenyloxycarbonyl, C_3–C_6–alkynyloxycarbonyl, (C_1-C_{20}-alkylthio)carbonyl (particularly preferably (C_1-C_6-alkylthio)carbonyl), C_1–C_6–alkylaminocarbonyl, C_3–C_6–alkenylaminocarbonyl, C_3–C_6–alkynylaminocarbonyl, N,N-di–(C_1–C_6–alkyl)aminocarbonyl, N–(C_3–C_6–alkenyl)–N–(C_1–C_6–alkyl)aminocarbonyl, N–(C_3–C_6–alkynyl)–N–(C_1–C_6–alkyl)aminocarbonyl, N–(C_1–C_6–alkoxy)–N–(C_1–C_6–alkyl)aminocarbonyl, N–(C_3–C_6–alkenyl)–N–(C_1–C_6–alkoxy)aminocarbonyl, N–(C_3–C_6–alkynyl)–N–(C_1–C_6–alkoxy)aminocarbonyl, di–(C_1–C_6–alkyl)aminothiocarbonyl, C_1–C_6–alkylcarbonyl–C_1–C_6–alkyl, C_1–C_6–alkoxyimino–C_1–C_6–alkyl, N–(C_1–C_6–alkylamino)imino–C_1–C_6–alkyl or N,N–di–(C_1–C_6–alkylamino)imino–C_1–C_6–alkyl, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three of the following groups:

cyano, C_1–C_4–alkoxy, C_1–C_4–alkylthio, C_1–C_4–alkylcarbonyl, C_1–C_4–alkoxycarbonyl, hydroxycarbonyl, di–(C_1–C_4–alkyl)aminocarbonyl, C_1–C_4–alkylcarbonyloxy or C_3–C_6–cycloalkyl;

phenyl, heterocyclyl, phenyl–C_1–C_6–alkyl, heterocyclyl–C_1–C_6–alkyl, phenylcarbonyl–C_1–C_6–alkyl, heterocyclylcarbonyl–C_1–C_6–alkyl, phenylcarbonyl,

heterocyclylcarbonyl, phenoxycarbonyl, heterocyclyloxycarbonyl, phenoxythiocarbonyl, heterocyclyloxythiocarbonyl, phenoxy-C_1-C_6-alkylcarbonyl, heterocyclyloxy-C_1-C_6-alkylcarbonyl, phenyl-C_2-C_6-alkenylcarbonyl or heterocyclyl-C_2-C_6-alkenylcarbonyl, where the phenyl and the heterocyclyl radical of the 16 last mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

R^8, R^9 are C_1-C_6-alkyl, C_3-C_6-alkenyl, C_3-C_6-haloalkenyl, C_3-C_6-cycloalkyl, hydroxy, C_1-C_6-alkoxy, di-C_1-C_6-alkylamino, or di-(C_1-C_6-haloalkyl)amino, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three of the following groups:

cyano, C_1-C_4-alkoxy, C_1-C_4-alkylthio, C_1-C_4-alkylcarbonyl, C_1-C_4-alkoxycarbonyl, hydroxycarbonyl, di-(C_1-C_4-alkyl)aminocarbonyl, C_1-C_4-alkylcarbonyloxy or C_3-C_6-cycloalkyl;

phenyl, heterocyclyl, phenyl-C_1-C_6-alkyl, heterocyclyl-C_1-C_6-alkyl, phenoxy, heterocyclyloxy, where the phenyl- and the heterocyclyl radical of the last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

R^{10} is C_1-C_6-alkyl, C_3-C_6-alkenyl, C_3-C_6-haloalkenyl, C_3-C_6-cycloalkyl, C_1-C_6-alkoxy, C_3-C_6-alkenyloxy or di-(C_1-C_6-alkyl)amino, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three radicals from the following group:

cyano, C_1-C_4-alkoxy, C_1-C_4-alkylthio, C_1-C_4-alkylcarbonyl, C_1-C_4-alkoxycarbonyl, hydroxycarbonyl, di-(C_1-C_4-alkyl)aminocarbonyl, C_1-C_4-alkylcarbonyloxy or C_3-C_6-cycloalkyl;

phenyl, heterocyclyl, phenyl-C_1-C_6-alkyl or heterocyclyl-C_1-C_6-alkyl, where the phenyl or heterocyclyl radical of the four last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

R^{11}, R^{12} are C_1-C_6-alkyl or C_3-C_6-alkenyl;

l 0 to 6;

m 2 to 4;

n 1 to 5;

p 2 to 5.

Particular preference is given to compounds of the formula I where the variables have the following meanings, either on their own or in combination:

R^1 is halogen, C_1–C_6–alkyl, C_1–C_6–haloalkyl, C_1–C_6–alkoxy, C_1–C_6–alkylthio or C_1–C_6–alkylsulfonyl;

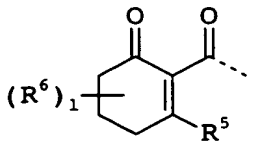
in particular halogen, such as fluorine or chlorine, C_1-C_6-alkyl, such as methyl or ethyl, C_1-C_6-haloalkyl, such as difluoromethyl or trifluoromethyl;

particularly preferably fluorine, chlorine, methyl, difluoromethyl or trifluoromethyl;

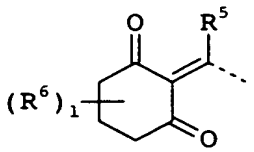
R^2 is hydrogen or C_1-C_6-alkyl, such as methyl or ethyl; in particular hydrogen or methyl;

R^3 is hydrogen or C_1-C_6-alkyl; in particular hydrogen;

R^4 is a compound IIa or IIb



IIa



IIb

where

R^5 is halogen, OR^7, SR^7, SO_2R^8, OSO_2R^8, $NR^{10}R^{11}$, $ONR^{11}R^{12}$, N-linked heterocyclyl or O-(N-linked heterocyclyl), where the heterocyclyl radical of the two last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

R^6 is halogen, cyano, C_1–C_6–alkyl, C_1–C_6–haloalkyl, di-(C_1-C_6-alkoxy)methyl, di-(C_1-C_6-alkylthio)methyl, (C_1-C_6-alkoxy)(C_1-C_6-alkylthio)methyl, hydroxyl, C_1–C_6–alkoxy, C_1–C_6–haloalkoxy, C_1-C_6-alkoxycarbonyloxy, C_1–C_6–alkylthio or C_1–C_6–haloalkylthio;

or

two radicals R^6, which are linked to the same carbon, together with this carbon form a carbonyl group;

R^7 is C_1–C_6–alkyl, C_3–C_6–alkenyl, C_3–C_6–haloalkenyl, C_3–C_6–alkynyl, C_1–C_{20}–alkylcarbonyl, C_3–C_6–cycloalkylcarbonyl, C_1–C_6–alkoxycarbonyl, C_3–C_6–alkenyloxycarbonyl, C_1–C_6–alkylaminocarbonyl, C_3–C_6–alkenylaminocarbonyl, N,N-di-(C_1–C_6–alkyl)aminocarbonyl, N–(C_3–C_6–alkenyl)–N–(C_1–C_6–alkyl)aminocarbonyl, N–(C_1–C_6–alkoxy)–N–(C_1–C_6–alkyl)aminocarbonyl, N–(C_3–C_6–alkenyl)–N–(C_1–C_6–alkoxy)aminocarbonyl, di-(C_1–C_6–alkyl)aminothiocarbonyl or C_1–C_6–alkylcarbonyl–C_1–C_6–alkyl, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three of the following groups:

cyano, C_1–C_4–alkoxy, C_1–C_4–alkylthio, C_1–C_4–alkylcarbonyl, C_1–C_4–alkoxycarbonyl, hydroxycarbonyl, di–(C_1–C_4–alkyl)aminocarbonyl, C_1–C_4–alkylcarbonyloxy or C_3–C_6–cycloalkyl;

phenyl, heterocyclyl, phenyl–C_1–C_6–alkyl, heterocyclyl–C_1–C_6–alkyl, phenylcarbonyl–C_1–C_6–alkyl, heterocyclylcarbonyl–C_1–C_6–alkyl, phenylcarbonyl, heterocyclylcarbonyl, phenoxycarbonyl, heterocyclyloxycarbonyl, phenoxythiocarbonyl, heterocyclyloxythiocarbonyl, phenoxy-C_1-C_6-alkylcarbonyl or heterocyclyloxy-C_1-C_6-alkylcarbonyl, where the phenyl and the heterocyclyl radical of the 14 last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

nitro, cyano, C_1–C_4–alkyl, C_1–C_4–haloalkyl, C_1–C_4–alkoxy or C_1–C_4–haloalkoxy;

R^8 is C_1–C_6–alkyl, C_3–C_6–alkenyl, C_3–C_6–haloalkenyl, C_3–C_6–cycloalkyl, hydroxyl, C_1–C_6–alkoxy, di-C_1-C_6-alkylamino or di-(C_1–C_6–haloalkyl)amino, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or fully halogenated and/or may carry one to three of the following groups:

cyano, C_1–C_4–alkoxy, C_1–C_4–alkylthio, C_1–C_4–alkylcarbonyl, C_1–C_4–alkoxycarbonyl, hydroxycarbonyl, di–(C_1–C_4–alkyl)aminocarbonyl, C_1–C_4–alkylcarbonyloxy or C_3–C_6–cycloalkyl;

phenyl, heterocyclyl, phenyl–C_1–C_6–alkyl, heterocyclyl–C_1–C_6–alkyl, phenoxy, heterocyclyloxy, where the phenyl and the heterocyclyl radical of the last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:

nitro, cyano, C_1–C_4–alkyl, C_1–C_4–haloalkyl, C_1–C_4–alkoxy or C_1–C_4–haloalkoxy;

R^{10} is C_1-C_6-alkyl, C_3-C_6-alkenyl, C_3-C_6-haloalkenyl, C_3-C_6-cycloalkyl, C_1-C_6-alkoxy, C_3-C_6-alkenyloxy or di-(C_1-C_6-alkyl)amino, where the abovementioned alkyl, cycloalkyl and alkoxy radicals may be partially or

fully halogenated and/or may carry one to three radicals from the following group:
cyano, C_1-C_4-alkoxy, C_1-C_4-alkylthio, C_1-C_4-alkylcarbonyl, C_1-C_4-alkoxycarbonyl, hydroxycarbonyl, di-(C_1-C_4-alkyl)aminocarbonyl, C_1-C_4-alkylcarbonyloxy or C_3-C_6-cycloalkyl;

phenyl, heterocyclyl, phenyl-C_1-C_6-alkyl or heterocyclyl-C_1-C_6-alkyl, where the phenyl or heterocyclyl radical of the four last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:
nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

R^{11}, R^{12} are C_1-C_6-alkyl or C_3-C_6-alkenyl;

l is 0 to 6.

Particular preference is also given to the compounds of the formula I where the variables have the following meaning, on their own or in combination:

R^1 is halogen, C_1-C_6-alkyl, C_1-C_6-haloalkyl, C_1-C_6-alkoxy, C_1-C_6-alkylthio, heterocyclyloxy or phenylthio, where the two last-mentioned radicals may be partially or fully halogenated and/or may carry one to three of the substituents mentioned below:
nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;
particularly preferably halogen, C_1-C_6-alkyl or C_1-C_6-alkylthio;

R^2 is hydrogen, C_1-C_6-alkyl or C_1-C_6-haloalkyl;
particularly preferably hydrogen;

R^3 is hydrogen;

R^5 is halogen, OR^7, SR^7, SOR^8, SO_2R^8, OSO_2R^8, OPR^8R^9, $OPOR^8R^9$, $OPSR^8R^9$, $NR^{10}R^{11}$ or N-bonded heterocyclyl which may be partially or fully halogenated and/or may carry one to three of the following radicals:
nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;
particularly preferably halogen, OR^7, $NR^{10}R^{11}$ or

N-bonded heterocyclyl which may be partially or fully halogenated and/or may carry one to three of the following radicals:
nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;
particularly preferably fluorine, OR^7, $NR^{10}R^{11}$ or N-bonded heterocyclyl selected from the group consisting of 4-morpholinyl or 4-oxo-1,4-dihydropyrid-1-yl;

R^6 is C_1-C_6-alkyl
or two radicals R^6 which are attached to the same carbon form, together with this carbon, a carbonyl group;

R^7 is C_1-C_6-alkyl, C_1-C_{20}-alkylcarbonyl, C_1-C_6-alkoxycarbonyl, (C_1-C_{20}-alkylthio)carbonyl, N,N-di-(C_1-C_6-alkyl)aminocarbonyl, phenyl, phenylcarbonyl or phenoxy-C_1-C_6-alkylcarbonyl, where the phenyl radical of the three last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:
nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;
particularly preferably C_1-C_6-alkyl, C_1-C_{20}-alkylcarbonyl, C_1-C_6-alkoxycarbonyl, (C_1-C_6-alkylthio)carbonyl, N,N-di-(C_1-C_6-alkyl)aminocarbonyl, phenyl, phenylcarbonyl or phenoxy-C_1-C_6-alkylcarbonyl, where the phenyl radical of the three last-mentioned substituents may be partially or fully halogenated and/or may carry one to three of the following radicals:
nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;
particularly preferably C_1-C_{20}-alkylthiocarbonyl;
most preferably C_1-C_6-alkylthiocarbonyl;

R^8,R^9 are C_1-C_6-alkyl, C_1-C_6-alkoxy, di-(C_1-C_6-alkyl)amino or phenyl, where the last-mentioned radical may be partially or fully halogenated and/or may carry one to three of the following radicals:
nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

R^{10} is C_1-C_6-alkyl or C_1-C_6-alkoxy;

R^{11} is C_1-C_6-alkyl;

l is from 0 to 6;
particularly preferably from 4 to 6;
in particular 6.

Particular preference is also given to compounds of the formula I where

R^6 is nitro, halogen, cyano, C_1-C_6-alkyl, C_1-C_6-haloalkyl, di-(C_1-C_6-alkoxy)methyl, di-(C_1-C_6-alkylthio)methyl, (C_1-C_6-alkoxy)(C_1-C_6-alkylthio)methyl, hydroxyl, C_1-C_6-alkoxy, C_1-C_6-haloalkoxy, C_1-C_6-alkoxycarbonyloxy, C_1-C_6-alkylthio, C_1-C_6-haloalkylthio, C_1-C_6-alkylsulfinyl, C_1-C_6-haloalkylsulfinyl, C_1-C_6-alkylsulfonyl, C_1-C_6-haloalkylsulfonyl, C_1-C_6-alkylcarbonyl, C_1-C_6-haloalkylcarbonyl, C_1-C_6-alkoxycarbonyl or C_1-C_6-haloalkoxycarbonyl;

or

two radicals R^6, which are linked to the same carbon, together form an $-O-(CH_2)_m-O-$, $-O-(CH_2)_m-O-$, $-O-(CH_2)_m-S-$, $-S-(CH_2)_m-S-$, $-O-(CH_2)_n-$ or $-S-(CH_2)_n$ chain which may be substituted by one to three radicals from the following group:
halogen, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl or C_1-C_4-alkoxycarbonyl;

or

two radicals R^6, which are linked to the same carbon, form a $-(CH_2)_p$ chain which may be interrupted by oxygen or sulfur and/or which may be substituted by one to four radicals from the following group:
halogen, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl or C_1-C_4-alkoxycarbonyl;

or

two radicals R^6, which are linked to the same carbon, together with this carbon form a carbonyl group.

Particular preference is given to compounds of the formula I where

R^6 is nitro, halogen, cyano, C_1-C_6-alkyl, C_1-C_6-haloalkyl, di-(C_1-C_6-alkoxy)methyl, di-(C_1-C_6-alkylthio)methyl, (C_1-C_6-alkoxy)(C_1-C_6-alkylthio)methyl, hydroxyl, C_1-C_6-alkoxy, C_1-C_6-haloalkoxy, C_1-C_6-alkoxycarbonyloxy, C_1-C_6-alkylthio, C_1-C_6-haloalkylthio, C_1-C_6-alkylsulfinyl, C_1-C_6-haloalkylsulfinyl, C_1-C_6-alkylsulfonyl, C_1-C_6-haloalkylsulfonyl, C_1-C_6-alkylcarbonyl, C_1-C_6-haloalkylcarbonyl, C_1-C_6-alkoxycarbonyl or C_1-C_6-haloalkoxycarbonyl;

or

two radicals R^6, which are linked to the same carbon, together with this carbon form a carbonyl group.

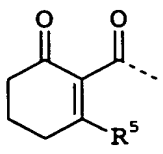
Particular preference is also given to the compounds of the formula I where

R^5 is halogen or (C_1-C_{20}-alkylthio)carbonyloxy; particularly preferably fluorine or (C_1-C_6-alkylthio)carbonyloxy;

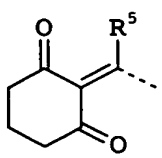
Particular preference is also given to the compounds of the formula I where

R^5 is $NR^{10}R^{11}$ or N-linked heterocyclyl which may be partially or fully halogenated and/or may carry one to three of the following radicals: nitro, cyano, C_1-C_4-alkyl, C_1-C_4-haloalkyl, C_1-C_4-alkoxy or C_1-C_4-haloalkoxy;

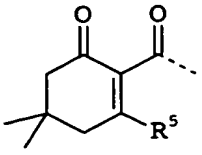
Particular preference is also given to the compounds of the formula I where R^4 has the following meanings:



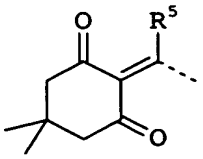
IIa1



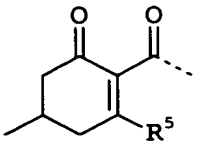
IIb1



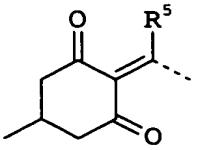
IIa2



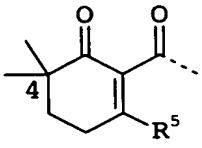
IIb2



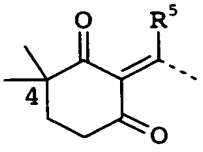
IIa3



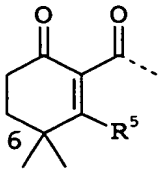
IIb3



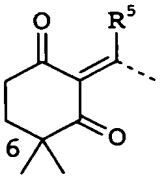
IIa4



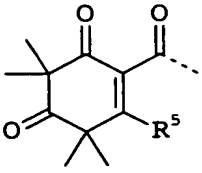
IIb4



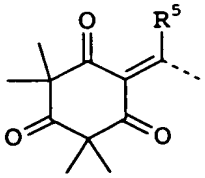
IIa5



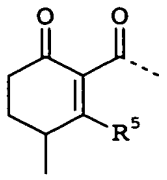
IIb5



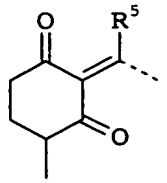
IIa6



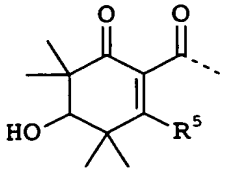
IIb6



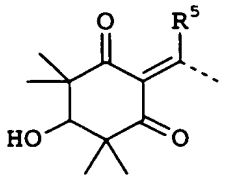
IIa7



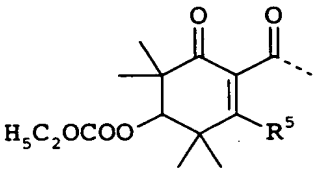
IIb7



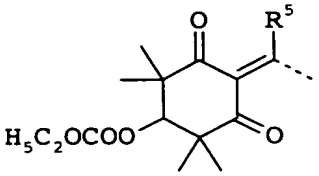
IIa8



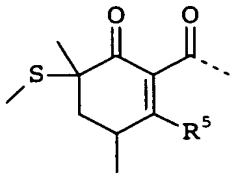
IIb8



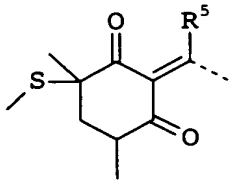
IIa9



IIb9



IIa10



IIb10

Very particular preference is given to the compounds of the formula I where

R^5 is $NR^{10}R^{11}$ or tetrahydropyrrol-1-yl, 2,3-dihydro-1H-pyrrol-1-yl, 2,5-dihydro-1H-pyrrol-1-yl, pyrrol-1-yl, tetrahydropyrazol-1-yl, tetrahydroisoxazol-2-yl, tetrahydrothiazol-2-yl, tetrahydroimidazol-1-yl, tetrahydrooxazol-3-yl, tetrahydrothiazol-3-yl, pyrazol-1-yl, imidazol-1-yl, 1,2,4-triazol-1-yl, tetrazol-1-yl, piperidin-1-yl, 4-oxo-1,4-dihydro-1-pyridyl, hexahydropyrimidin-1-yl, hexahydropyrazin-1-yl, tetrahydro-1,4-oxazin-4-yl, tetrahydro-1,2-oxazin-2-yl, succinimide, maleimide or

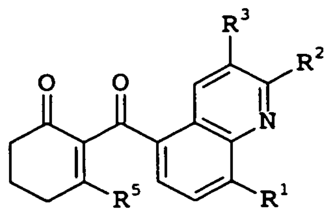
glutarimide, where the abovementioned heterocycles may be partially or fully halogenated and/or may carry one to three of the following radicals:

nitro, cyano, C_1-C_4-alkyl, such as methyl or ethyl, C_1-C_4-haloalkyl such as chloromethyl, difluoromethyl or trifluoromethyl, C_1-C_4-alkoxy, such as methoxy or ethoxy or C_1-C_4-haloalkoxy such as difluoromethoxy or trifluoromethoxy;

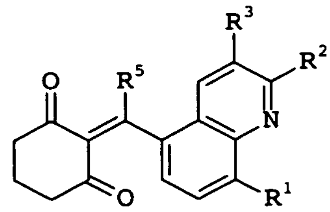
R^{10}	C_1-C_6-alkoxy

Extraordinary preference is given to compounds of the formula Ia1 and Ib1 (≡ I where l = 0), in particular to the compounds Ia1.1 to Ia1.456 and the compounds Ib1.1 to Ib1.456, where the radical definitions R^1 to R^5 and l have a preferred meaning for the compounds according to the invention not only in combination with each other, but in each case also on their own.

Table 1:



Ia1



Ib1

No.	R^1	R^2	R^3	R^5
Ia1.1 or Ib1.1	CH_3	H	H	F
Ia1.2 or Ib1.2	CH_3	H	H	Cl
Ia1.3 or Ib1.3	CH_3	H	H	Br
Ia1.4 or Ib1.4	CH_3	H	H	I
Ia1.5 or Ib1.5	CH_3	H	H	SCH_3
Ia1.6 or Ib1.6	CH_3	H	H	SCH_2CH_3
Ia1.7 or Ib1.7	CH_3	H	H	$SCO(N(CH_3)_2)_2$
Ia1.8 or Ib1.8	CH_3	H	H	SO_2CH_3
Ia1.9 or Ib1.9	CH_3	H	H	$SO_2CH_2CH_3$
Ia1.10 or Ib1.10	CH_3	H	H	SC_6H_5
Ia1.11 or Ib1.11	CH_3	H	H	$S(4-CH_3-C_6H_4)$
Ia1.12 or Ib1.12	CH_3	H	H	$S(4-Cl-C_6H_4)$
Ia1.13 or Ib1.13	CH_3	H	H	$SO_2C_6H_5$
Ia1.14 or Ib1.14	CH_3	H	H	$SO_2(4-CH_3-C_6H_4)$
Ia1.15 or Ib1.15	CH_3	H	H	$SO_2(4-Cl-C_6H_4)$
Ia1.16 or Ib1.16	CH_3	H	H	4-morpholinyl
Ia1.17 or Ib1.17	CH_3	H	H	1-pyrrolidinyl
Ia1.18 or Ib1.18	CH_3	H	H	1-(1,2,4-triazolyl)
Ia1.19 or Ib1.19	CH_3	H	H	1-imidazolyl
Ia1.20 or Ib1.20	CH_3	H	H	1-pyrazolyl
Ia1.21 or Ib1.21	CH_3	H	H	4-oxo-1,4-dihydro-1-pyridyl
Ia1.22 or Ib1.22	CH_3	H	H	$N(OCH_3)CH_3$
Ia1.23 or Ib1.23	CH_3	H	H	2-tetrahydroisoxazolyl
Ia1.24 or Ib1.24	CH_3	H	H	$N(CH_3)N(CH_3)_2$
Ia1.25 or Ib1.25	CH_3	H	H	$N(CH_2CH{=}CH_2)N(CH_3)_2$
Ia1.26 or Ib1.26	CH_3	H	H	$OPO(OCH_3)_2$
Ia1.27 or Ib1.27	CH_3	H	H	$OPO(OCH_2CH_3)_2$
Ia1.28 or Ib1.28	CH_3	H	H	$OPO(N(CH_3)_2)_2$
Ia1.29 or Ib1.29	CH_3	H	H	$OPO(OC_6H_5)_2$

No.	R^1	R^2	R^3	R^5
Ia1.30 or Ib1.30	CH_3	H	H	$OPO(CH_3)_2$
Ia1.31 or Ib1.31	CH_3	H	H	$OPO(CH_2CH_3)_2$
Ia1.32 or Ib1.32	CH_3	H	H	$OPO(C_6H_5)_2$
Ia1.33 or Ib1.33	CH_3	H	H	$OPS(OCH_3)_2$
Ia1.34 or Ib1.34	CH_3	H	H	$OPS(OCH_2CH_3)_2$
Ia1.35 or Ib1.35	CH_3	H	H	$OP(OCH_3)_2$
Ia1.36 or Ib1.36	CH_3	H	H	$OP(OCH_2CH_3)_2$
Ia1.37 or Ib1.37	CH_3	H	H	$PO(OCH_3)_2$
Ia1.38 or Ib1.38	CH_3	H	H	$PO(OCH_2CH_3)_2$
Ia1.39 or Ib1.39	CH_3	H	H	$PO(C_6H_5)_2$
Ia1.40 or Ib1.40	CH_3	H	H	OCH_3
Ia1.41 or Ib1.41	CH_3	H	H	OCH_2CH_3
Ia1.42 or Ib1.42	CH_3	H	H	$OCH_2C_6H_5$
Ia1.43 or Ib1.43	CH_3	H	H	OCH_2(2-furyl)
Ia1.44 or Ib1.44	CH_3	H	H	OCH_2(3-furyl)
Ia1.45 or Ib1.45	CH_3	H	H	$OCOOCH_3$
Ia1.46 or Ib1.46	CH_3	H	H	$OCOOCH_2CH_3$
Ia1.47 or Ib1.47	CH_3	H	H	$OCOOCH(CH_3)_2$
Ia1.48 or Ib1.48	CH_3	H	H	$OCOOC_6H_5$
Ia1.49 or Ib1.49	CH_3	H	H	$OCOOC(CH_3)_3$
Ia1.50 or Ib1.50	CH_3	H	H	$OCSOC_6H_5$
Ia1.51 or Ib1.51	CH_3	H	H	$OCSN(CH_3)_2$
Ia1.52 or Ib1.52	CH_3	H	H	$OCON(CH_3)_2$
Ia1.53 or Ib1.53	CH_3	H	H	$OCOSCH_3$
Ia1.54 or Ib1.54	CH_3	H	H	$ON(CH_3)_2$
Ia1.55 or Ib1.55	CH_3	H	H	O-1-piperidyl
Ia1.56 or Ib1.56	CH_3	H	H	$OCOCH_3$
Ia1.57 or Ib1.57	CH_3	H	H	$OCOCH_2CH_3$
Ia1.58 or Ib1.58	CH_3	H	H	$OCOCH(CH_3)_2$
Ia1.59 or Ib1.59	CH_3	H	H	$OCOC(CH_3)_3$
Ia1.60 or Ib1.60	CH_3	H	H	$OCO(CH_2)_6CH_3$
Ia1.61 or Ib1.61	CH_3	H	H	$OCO(CH_2)_7CH_3$
Ia1.62 or Ib1.62	CH_3	H	H	$OCO(CH_2)_{16}CH_3$
Ia1.63 or Ib1.63	CH_3	H	H	$OCO(CH_2)_{14}CH_3$
Ia1.64 or Ib1.64	CH_3	H	H	$OCOCH_2CH_2CH=CH_2$
Ia1.65 or Ib1.65	CH_3	H	H	$OCO(CH_2)_3O(2,4\text{-}Cl_2\text{-}C_6H_3)$
Ia1.66 or Ib1.66	CH_3	H	H	$OCOCH(CH_3)O$-(2-CH_3-4-Cl-C_6H_3)
Ia1.67 or Ib1.67	CH_3	H	H	OCOcyclopropyl
Ia1.68 or Ib1.68	CH_3	H	H	OCOcyclopentyl
Ia1.69 or Ib1.69	CH_3	H	H	OCOcyclohexyl
Ia1.70 or Ib1.70	CH_3	H	H	$OCOC_6H_5$

No.	R^1	R^2	R^3	R^5
Ia1.71 or Ib1.71	CH_3	H	H	OCO(2-tetrahydrofuryl)
Ia1.72 or Ib1.72	CH_3	H	H	OCO(2-furyl)
Ia1.73 or Ib1.73	CH_3	H	H	OCO(2-thienyl)
Ia1.74 or Ib1.74	CH_3	H	H	OCO(3-pyridyl)
Ia1.75 or Ib1.75	CH_3	H	H	OSO_2CH_3
Ia1.76 or Ib1.76	CH_3	H	H	$OSO_2CH_2CH_3$
Ia1.77 or Ib1.77	F	H	H	F
Ia1.78 or Ib1.78	F	H	H	Cl
Ia1.79 or Ib1.79	F	H	H	Br
Ia1.80 or Ib1.80	F	H	H	I
Ia1.81 or Ib1.81	F	H	H	SCH_3
Ia1.82 or Ib1.82	F	H	H	SCH_2CH_3
Ia1.83 or Ib1.83	F	H	H	$SCO(N(CH_3)_2)_2$
Ia1.84 or Ib1.84	F	H	H	SO_2CH_3
Ia1.85 or Ib1.85	F	H	H	$SO_2CH_2CH_3$
Ia1.86 or Ib1.86	F	H	H	SC_6H_5
Ia1.87 or Ib1.87	F	H	H	$S(4\text{-}CH_3\text{-}C_6H_4)$
Ia1.88 or Ib1.88	F	H	H	$S(4\text{-}Cl\text{-}C_6H_4)$
Ia1.89 or Ib1.89	F	H	H	$SO_2C_6H_5$
Ia1.90 or Ib1.90	F	H	H	$SO_2(4\text{-}CH_3\text{-}C_6H_4)$
Ia1.91 or Ib1.91	F	H	H	$SO_2(4\text{-}Cl\text{-}C_6H_4)$
Ia1.92 or Ib1.92	F	H	H	4-morpholinyl
Ia1.93 or Ib1.93	F	H	H	1-pyrrolidinyl
Ia1.94 or Ib1.94	F	H	H	1-(1,2,4-triazolyl)
Ia1.95 or Ib1.95	F	H	H	1-imidazolyl
Ia1.96 or Ib1.96	F	H	H	1-pyrazolyl
Ia1.97 or Ib1.97	F	H	H	4-oxo-1,4-dihydro-1-pyridyl
Ia1.98 or Ib1.98	F	H	H	$N(OCH_3)CH_3$
Ia1.99 or Ib1.99	F	H	H	2-tetrahydroisoxazolyl
Ia1.100 or Ib1.100	F	H	H	$N(CH_3)N(CH_3)_2$
Ia1.101 or Ib1.101	F	H	H	$N(CH_2CH{=}CH_2)N(CH_3)_2$
Ia1.102 or Ib1.102	F	H	H	$OPO(OCH_3)_2$
Ia1.103 or Ib1.103	F	H	H	$OPO(N(CH_3)_2)_2$
Ia1.104 or Ib1.104	F	H	H	$OPO(OCH_2CH_3)_2$
Ia1.105 or Ib1.105	F	H	H	$OPO(OC_6H_5)_2$
Ia1.106 or Ib1.106	F	H	H	$OPO(CH_3)_2$
Ia1.107 or Ib1.107	F	H	H	$OPO(CH_2CH_3)_2$
Ia1.108 or Ib1.108	F	H	H	$OPO(C_6H_5)_2$
Ia1.109 or Ib1.109	F	H	H	$OPS(OCH_3)_2$
Ia1.110 or Ib1.110	F	H	H	$OPS(OCH_2CH_3)_2$
Ia1.111 or Ib1.111	F	H	H	$OP(OCH_3)_2$

No.	R^1	R^2	R^3	R^5
Ia1.112 or Ib1.112	F	H	H	$OP(OCH_2CH_3)_2$
Ia1.113 or Ib1.113	F	H	H	$PO(OCH_3)_2$
Ia1.114 or Ib1.114	F	H	H	$PO(OCH_2CH_3)_2$
Ia1.115 or Ib1.115	F	H	H	$PO(C_6H_5)_2$
Ia1.116 or Ib1.116	F	H	H	OCH_3
Ia1.117 or Ib1.117	F	H	H	OCH_2CH_3
Ia1.118 or Ib1.118	F	H	H	$OCH_2C_6H_5$
Ia1.119 or Ib1.119	F	H	H	OCH_2(2-furyl)
Ia1.120 or Ib1.120	F	H	H	OCH_2(3-furyl)
Ia1.121 or Ib1.121	F	H	H	$OCOOCH_3$
Ia1.122 or Ib1.122	F	H	H	$OCOOCH_2CH_3$
Ia1.123 or Ib1.123	F	H	H	$OCOOCH(CH_3)_2$
Ia1.124 or Ib1.124	F	H	H	$OCOOC_6H_5$
Ia1.125 or Ib1.125	F	H	H	$OCOOC(CH_3)_3$
Ia1.126 or Ib1.126	F	H	H	$OCSOC_6H_5$
Ia1.127 or Ib1.127	F	H	H	$OCSN(CH_3)_2$
Ia1.128 or Ib1.128	F	H	H	$OCON(CH_3)_2$
Ia1.129 or Ib1.129	F	H	H	$OCOSCH_3$
Ia1.130 or Ib1.130	F	H	H	$ON(CH_3)_2$
Ia1.131 or Ib1.131	F	H	H	O-1-piperidyl
Ia1.132 or Ib1.132	F	H	H	$OCOCH_3$
Ia1.133 or Ib1.133	F	H	H	$OCOCH_2CH_3$
Ia1.134 or Ib1.134	F	H	H	$OCOCH(CH_3)_2$
Ia1.135 or Ib1.135	F	H	H	$OCOC(CH_3)_3$
Ia1.136 or Ib1.136	F	H	H	$OCO(CH_2)_6CH_3$
Ia1.137 or Ib1.137	F	H	H	$OCO(CH_2)_7CH_3$
Ia1.138 or Ib1.138	F	H	H	$OCO(CH_2)_{16}CH_3$
Ia1.139 or Ib1.139	F	H	H	$OCO(CH_2)_{14}CH_3$
Ia1.140 or Ib1.140	F	H	H	$OCOCH_2CH_2CH=CH_2$
Ia1.141 or Ib1.141	F	H	H	$OCO(CH_2)_3O(2,4-Cl_2-C_6H_3)$
Ia1.142 or Ib1.142	F	H	H	$OCOCH(CH_3)O-$ $(2-CH_3-4-Cl-C_6H_3)$
Ia1.143 or Ib1.143	F	H	H	OCOcyclopropyl
Ia1.144 or Ib1.144	F	H	H	OCOcyclopentyl
Ia1.145 or Ib1.145	F	H	H	OCOcyclohexyl
Ia1.146 or Ib1.146	F	H	H	$OCOC_6H_5$
Ia1.147 or Ib1.147	F	H	H	OCO(2-tetrahydrofuryl)
Ia1.148 or Ib1.148	F	H	H	OCO(2-furyl)
Ia1.149 or Ib1.149	F	H	H	OCO(2-thienyl)
Ia1.150 or Ib1.150	F	H	H	OCO(3-pyridyl)
Ia1.151 or Ib1.151	F	H	H	OSO_2CH_3
Ia1.152 or Ib1.152	F	H	H	$OSO_2CH_2CH_3$

No.	R^1	R^2	R^3	R^5
Ia1.153 or Ib1.153	CF_3	H	H	F
Ia1.154 or Ib1.154	CF_3	H	H	Cl
Ia1.155 or Ib1.155	CF_3	H	H	Br
Ia1.156 or Ib1.156	CF_3	H	H	I
Ia1.157 or Ib1.157	CF_3	H	H	SCH_3
Ia1.158 or Ib1.158	CF_3	H	H	SCH_2CH_3
Ia1.159 or Ib1.159	CF_3	H	H	$SCO(N(CH_3)_2)_2$
Ia1.160 or Ib1.160	CF_3	H	H	SO_2CH_3
Ia1.161 or Ib1.161	CF_3	H	H	$SO_2CH_2CH_3$
Ia1.162 or Ib1.162	CF_3	H	H	SC_6H_5
Ia1.163 or Ib1.163	CF_3	H	H	$S(4\text{-}CH_3\text{-}C_6H_4)$
Ia1.164 or Ib1.164	CF_3	H	H	$S(4\text{-}Cl\text{-}C_6H_4)$
Ia1.165 or Ib1.165	CF_3	H	H	$SO_2C_6H_5$
Ia1.166 or Ib1.166	CF_3	H	H	$SO_2(4\text{-}CH_3\text{-}C_6H_4)$
Ia1.167 or Ib1.167	CF_3	H	H	$SO_2(4\text{-}Cl\text{-}C_6H_4)$
Ia1.168 or Ib1.168	CF_3	H	H	4-morpholinyl
Ia1.169 or Ib1.169	CF_3	H	H	1-pyrrolidinyl
Ia1.170 or Ib1.170	CF_3	H	H	1-(1,2,4-triazolyl)
Ia1.171 or Ib1.171	CF_3	H	H	1-imidazolyl
Ia1.172 or Ib1.172	CF_3	H	H	1-pyrazolyl
Ia1.173 or Ib1.173	CF_3	H	H	4-oxo-1,4-dihydro-1-pyridyl
Ia1.174 or Ib1.174	CF_3	H	H	$N(OCH_3)CH_3$
Ia1.175 or Ib1.175	CF_3	H	H	2-tetrahydroisoxazolyl
Ia1.176 or Ib1.176	CF_3	H	H	$N(CH_3)N(CH_3)_2$
Ia1.177 or Ib1.177	CF_3	H	H	$N(CH_2CH{=}CH_2)N(CH_3)_2$
Ia1.178 or Ib1.178	CF_3	H	H	$OPO(OCH_3)_2$
Ia1.179 or Ib1.179	CF_3	H	H	$OPO(OCH_2CH_3)_2$
Ia1.180 or Ib1.180	CF_3	H	H	$OPO(N(CH_3)_2)_2$
Ia1.181 or Ib1.181	CF_3	H	H	$OPO(OC_6H_5)_2$
Ia1.182 or Ib1.182	CF_3	H	H	$OPO(CH_3)_2$
Ia1.183 or Ib1.183	CF_3	H	H	$OPO(CH_2CH_3)_2$
Ia1.184 or Ib1.184	CF_3	H	H	$OPO(C_6H_5)_2$
Ia1.185 or Ib1.185	CF_3	H	H	$OPS(OCH_3)_2$
Ia1.186 or Ib1.186	CF_3	H	H	$OPS(OCH_2CH_3)_2$
Ia1.187 or Ib1.187	CF_3	H	H	$OP(OCH_3)_2$
Ia1.188 or Ib1.188	CF_3	H	H	$OP(OCH_2CH_3)_2$
Ia1.189 or Ib1.189	CF_3	H	H	$PO(OCH_3)_2$
Ia1.190 or Ib1.190	CF_3	H	H	$PO(OCH_2CH_3)_2$
Ia1.191 or Ib1.191	CF_3	H	H	$PO(C_6H_5)_2$
Ia1.192 or Ib1.192	CF_3	H	H	OCH_3
Ia1.193 or Ib1.193	CF_3	H	H	OCH_2CH_3

No.	R^1	R^2	R^3	R^5
Ia1.194 or Ib1.194	CF_3	H	H	$OCH_2C_6H_5$
Ia1.195 or Ib1.195	CF_3	H	H	OCH_2(2-furyl)
Ia1.196 or Ib1.196	CF_3	H	H	OCH_2(3-furyl)
Ia1.197 or Ib1.197	CF_3	H	H	$OCOOCH_3$
Ia1.198 or Ib1.198	CF_3	H	H	$OCOOCH_2CH_3$
Ia1.199 or Ib1.199	CF_3	H	H	$OCOOCH(CH_3)_2$
Ia1.200 or Ib1.200	CF_3	H	H	$OCOOC_6H_5$
Ia1.201 or Ib1.201	CF_3	H	H	$OCOOC(CH_3)_3$
Ia1.202 or Ib1.202	CF_3	H	H	$OCSOC_6H_5$
Ia1.203 or Ib1.203	CF_3	H	H	$OCSN(CH_3)_2$
Ia1.204 or Ib1.204	CF_3	H	H	$OCON(CH_3)_2$
Ia1.205 or Ib1.205	CF_3	H	H	$OCOSCH_3$
Ia1.206 or Ib1.206	CF_3	H	H	$ON(CH_3)_2$
Ia1.207 or Ib1.207	CF_3	H	H	O-1-piperidyl
Ia1.208 or Ib1.208	CF_3	H	H	$OCOCH_3$
Ia1.209 or Ib1.209	CF_3	H	H	$OCOCH_2CH_3$
Ia1.210 or Ib1.210	CF_3	H	H	$OCOCHC(CH_3)_2$
Ia1.211 or Ib1.211	CF_3	H	H	$OCOC(CH_3)_3$
Ia1.212 or Ib1.212	CF_3	H	H	$OCO(CH_2)_6CH_3$
Ia1.213 or Ib1.213	CF_3	H	H	$OCO(CH_2)_7CH_3$
Ia1.214 or Ib1.214	CF_3	H	H	$OCO(CH_2)_{16}CH_3$
Ia1.215 or Ib1.215	CF_3	H	H	$OCO(CH_2)_{14}CH_3$
Ia1.216 or Ib1.216	CF_3	H	H	$OCOCH_2CH_2CH=CH_2$
Ia1.217 or Ib1.217	CF_3	H	H	$OCO(CH_2)_3O(2,4\text{-}Cl_2\text{-}C_6H_3)$
Ia1.218 or Ib1.218	CF_3	H	H	$OCOCH(CH_3)O$-(2-CH_3-4-Cl-C_6H_3)
Ia1.219 or Ib1.219	CF_3	H	H	OCOcyclopropyl
Ia1.220 or Ib1.220	CF_3	H	H	OCOcyclopentyl
Ia1.221 or Ib1.221	CF_3	H	H	OCOcyclohexyl
Ia1.222 or Ib1.222	CF_3	H	H	$OCOC_6H_5$
Ia1.223 or Ib1.223	CF_3	H	H	OCO(2-tetrahydrofuryl)
Ia1.224 or Ib1.224	CF_3	H	H	OCO(2-furyl)
Ia1.225 or Ib1.225	CF_3	H	H	OCO(2-thienyl)
Ia1.226 or Ib1.226	CF_3	H	H	OCO(3-pyridyl)
Ia1.227 or Ib1.227	CF_3	H	H	OSO_2CH_3
Ia1.228 or Ib1.228	CF_3	H	H	$OSO_2CH_2CH_3$
Ia1.229 or Ib1.229	Cl	H	H	F
Ia1.230 or Ib1.230	Cl	H	H	Cl
Ia1.231 or Ib1.231	Cl	H	H	Br
Ia1.232 or Ib1.232	Cl	H	H	I
Ia1.233 or Ib1.233	Cl	H	H	SCH_3
Ia1.234 or Ib1.234	Cl	H	H	SCH_2CH_3

No.	R^1	R^2	R^3	R^5
Ia1.235 or Ib1.235	Cl	H	H	$SCO(N(CH_3)_2)_2$
Ia1.236 or Ib1.236	Cl	H	H	SO_2CH_3
Ia1.237 or Ib1.237	Cl	H	H	$SO_2CH_2CH_3$
Ia1.238 or Ib1.238	Cl	H	H	SC_6H_5
Ia1.239 or Ib1.239	Cl	H	H	$S(4-CH_3-C_6H_4)$
Ia1.240 or Ib1.240	Cl	H	H	$S(4-Cl-C_6H_4)$
Ia1.241 or Ib1.241	Cl	H	H	$SO_2C_6H_5$
Ia1.242 or Ib1.242	Cl	H	H	$SO_2(4-CH_3-C_6H_4)$
Ia1.243 or Ib1.243	Cl	H	H	$SO_2(4-Cl-C_6H_4)$
Ia1.244 or Ib1.244	Cl	H	H	4-morpholinyl
Ia1.245 or Ib1.245	Cl	H	H	1-pyrrolidinyl
Ia1.246 or Ib1.246	Cl	H	H	1-(1,2,4-triazolyl)
Ia1.247 or Ib1.247	Cl	H	H	1-imidazolyl
Ia1.248 or Ib1.248	Cl	H	H	1-pyrazolyl
Ia1.249 or Ib1.249	Cl	H	H	4-oxo-1,4-dihydro-1-pyridyl
Ia1.250 or Ib1.250	Cl	H	H	$N(OCH_3)CH_3$
Ia1.251 or Ib1.251	Cl	H	H	2-tetrahydroisoxazolyl
Ia1.252 or Ib1.252	Cl	H	H	$N(CH_3)N(CH_3)_2$
Ia1.253 or Ib1.253	Cl	H	H	$N(CH_2CH=CH_2)N(CH_3)_2$
Ia1.254 or Ib1.254	Cl	H	H	$OPO(OCH_3)_2$
Ia1.255 or Ib1.255	Cl	H	H	$OPO(OCH_2CH_3)_2$
Ia1.256 or Ib1.256	Cl	H	H	$OPO(N(CH_3)_2)_2$
Ia1.257 or Ib1.257	Cl	H	H	$OPO(OC_6H_5)_2$
Ia1.258 or Ib1.258	Cl	H	H	$OPO(CH_3)_2$
Ia1.259 or Ib1.259	Cl	H	H	$OPO(CH_2CH_3)_2$
Ia1.260 or Ib1.260	Cl	H	H	$OPO(C_6H_5)_2$
Ia1.261 or Ib1.261	Cl	H	H	$OPS(OCH_3)_2$
Ia1.262 or Ib1.262	Cl	H	H	$OPS(OCH_2CH_3)_2$
Ia1.263 or Ib1.263	Cl	H	H	$OP(OCH_3)_2$
Ia1.264 or Ib1.264	Cl	H	H	$OP(OCH_2CH_3)_2$
Ia1.265 or Ib1.265	Cl	H	H	$PO(OCH_3)_2$
Ia1.266 or Ib1.266	Cl	H	H	$PO(OCH_2CH_3)_2$
Ia1.267 or Ib1.267	Cl	H	H	$PO(C_6H_5)_2$
Ia1.268 or Ib1.268	Cl	H	H	OCH_3
Ia1.269 or Ib1.269	Cl	H	H	OCH_2CH_3
Ia1.270 or Ib1.270	Cl	H	H	$OCH_2C_6H_5$
Ia1.271 or Ib1.271	Cl	H	H	OCH_2(2-furyl)
Ia1.272 or Ib1.272	Cl	H	H	OCH_2(3-furyl)
Ia1.273 or Ib1.273	Cl	H	H	$OCOOCH_3$
Ia1.274 or Ib1.274	Cl	H	H	$OCOOCH_2CH_3$
Ia1.275 or Ib1.275	Cl	H	H	$OCOOCH(CH_3)_2$

No.	R^1	R^2	R^3	R^5
Ia1.276 or Ib1.276	Cl	H	H	$OCOOC_6H_5$
Ia1.277 or Ib1.277	Cl	H	H	$OCOOC(CH_3)_3$
Ia1.278 or Ib1.278	Cl	H	H	$OCSOC_6H_5$
Ia1.279 or Ib1.279	Cl	H	H	$OCSN(CH_3)_2$
Ia1.280 or Ib1.280	Cl	H	H	$OCON(CH_3)_2$
Ia1.281 or Ib1.281	Cl	H	H	$OCOSCH_3$
Ia1.282 or Ib1.282	Cl	H	H	$ON(CH_3)_2$
Ia1.283 or Ib1.283	Cl	H	H	O-1-piperidyl
Ia1.284 or Ib1.284	Cl	H	H	$OCOCH_3$
Ia1.285 or Ib1.285	Cl	H	H	$OCOCH_2CH_3$
Ia1.286 or Ib1.286	Cl	H	H	$OCOCH(CH_3)_2$
Ia1.287 or Ib1.287	Cl	H	H	$OCOC(CH_3)_3$
Ia1.288 or Ib1.288	Cl	H	H	$OCO(CH_2)_6CH_3$
Ia1.289 or Ib1.289	Cl	H	H	$OCO(CH_2)_7CH_3$
Ia1.290 or Ib1.290	Cl	H	H	$OCO(CH_2)_{16}CH_3$
Ia1.291 or Ib1.291	Cl	H	H	$OCO(CH_2)_{14}CH_3$
Ia1.292 or Ib1.292	Cl	H	H	$OCOCH_2CH_2CH=CH_2$
Ia1.293 or Ib1.293	Cl	H	H	$OCO(CH_2)_3O(2,4\text{-}Cl_2\text{-}C_6H_3)$
Ia1.294 or Ib1.294	Cl	H	H	$OCOCH(CH_3)O\text{-}(2\text{-}CH_3\text{-}4\text{-}Cl\text{-}C_6H_3)$
Ia1.295 or Ib1.295	Cl	H	H	OCOcyclopropyl
Ia1.296 or Ib1.296	Cl	H	H	OCOcyclopentyl
Ia1.297 or Ib1.297	Cl	H	H	OCOcyclohexyl
Ia1.298 or Ib1.298	Cl	H	H	$OCOC_6H_5$
Ia1.299 or Ib1.299	Cl	H	H	OCO(2-tetrahydrofuryl)
Ia1.300 or Ib1.300	Cl	H	H	OCO(2-furyl)
Ia1.301 or Ib1.301	Cl	H	H	OCO(2-thienyl)
Ia1.302 or Ib1.302	Cl	H	H	OCO(3-pyridyl)
Ia1.303 or Ib1.303	Cl	H	H	OSO_2CH_3
Ia1.304 or Ib1.304	Cl	H	H	$OSO_2CH_2CH_3$
Ia1.305 or Ib1.305	CHF_2	H	H	F
Ia1.306 or Ib1.306	CHF_2	H	H	Cl
Ia1.307 or Ib1.307	CHF_2	H	H	Br
Ia1.308 or Ib1.308	CHF_2	H	H	I
Ia1.309 or Ib1.309	CHF_2	H	H	SCH_3
Ia1.310 or Ib1.310	CHF_2	H	H	SCH_2CH_3
Ia1.311 or Ib1.311	CHF_2	H	H	$SCO(N(CH_3)_2)_2$
Ia1.312 or Ib1.312	CHF_2	H	H	SO_2CH_3
Ia1.313 or Ib1.313	CHF_2	H	H	$SO_2CH_2CH_3$
Ia1.314 or Ib1.314	CHF_2	H	H	SC_6H_5
Ia1.315 or Ib1.315	CHF_2	H	H	$S(4\text{-}CH_3\text{-}C_6H_4)$
Ia1.316 or Ib1.316	CHF_2	H	H	$S(4\text{-}Cl\text{-}C_6H_4)$

No.	R^1	R^2	R^3	R^5
Ia1.317 or Ib1.317	CHF_2	H	H	$SO_2C_6H_5$
Ia1.318 or Ib1.318	CHF_2	H	H	$SO_2(4\text{-}CH_3\text{-}C_6H_4)$
Ia1.319 or Ib1.319	CHF_2	H	H	$SO_2(4\text{-}Cl\text{-}C_6H_4)$
Ia1.320 or Ib1.320	CHF_2	H	H	4-morpholinyl
Ia1.321 or Ib1.321	CHF_2	H	H	1-pyrrolidinyl
Ia1.322 or Ib1.322	CHF_2	H	H	1-(1,2,4-triazolyl)
Ia1.323 or Ib1.323	CHF_2	H	H	1-imidazolyl
Ia1.324 or Ib1.324	CHF_2	H	H	1-pyrazolyl
Ia1.325 or Ib1.325	CHF_2	H	H	4-oxo-1,4-dihydro-1-pyridyl
Ia1.326 or Ib1.326	CHF_2	H	H	$N(OCH_3)CH_3$
Ia1.327 or Ib1.327	CHF_2	H	H	2-tetrahydroisoxazolyl
Ia1.328 or Ib1.328	CHF_2	H	H	$N(CH_3)N(CH_3)_3$
Ia1.329 or Ib1.329	CHF_2	H	H	$N(CH_2CH{=}CH_2)N(CH_3)_2$
Ia1.330 or Ib1.330	CHF_2	H	H	$OPO(OCH_3)_2$
Ia1.331 or Ib1.331	CHF_2	H	H	$OPO(OCH_2CH_3)_2$
Ia1.332 or Ib1.332	CHF_2	H	H	$OPO(N(CH_3)_2)_2$
Ia1.333 or Ib1.333	CHF_2	H	H	$OPO(OC_6H_5)_2$
Ia1.334 or Ib1.334	CHF_2	H	H	$OPO(CH_3)_2$
Ia1.335 or Ib1.335	CHF_2	H	H	$OPO(CH_2CH_3)_2$
Ia1.336 or Ib1.336	CHF_2	H	H	$OPO(C_6H_5)_2$
Ia1.337 or Ib1.337	CHF_2	H	H	$OPS(OCH_3)_2$
Ia1.338 or Ib1.338	CHF_2	H	H	$OPS(OCH_2CH_3)_2$
Ia1.339 or Ib1.339	CHF_2	H	H	$OP(OCH_3)_2$
Ia1.340 or Ib1.340	CHF_2	H	H	$OP(OCH_2CH_3)_2$
Ia1.341 or Ib1.341	CHF_2	H	H	$PO(OCH_3)_2$
Ia1.342 or Ib1.342	CHF_2	H	H	$PO(OCH_2CH_3)_2$
Ia1.343 or Ib1.343	CHF_2	H	H	$PO(C_6H_5)_2$
Ia1.344 or Ib1.344	CHF_2	H	H	OCH_3
Ia1.345 or Ib1.345	CHF_2	H	H	OCH_2CH_3
Ia1.346 or Ib1.346	CHF_2	H	H	$OCH_2C_6H_5$
Ia1.347 or Ib1.347	CHF_2	H	H	OCH_2(2-furyl)
Ia1.348 or Ib1.348	CHF_2	H	H	OCH_2(3-furyl)
Ia1.349 or Ib1.349	CHF_2	H	H	$OCOOCH_3$
Ia1.350 or Ib1.350	CHF_2	H	H	$OCOOCH_2CH_3$
Ia1.351 or Ib1.351	CHF_2	H	H	$OCOOCH(CH_3)_2$
Ia1.352 or Ib1.352	CHF_2	H	H	$OCOOC_6H_5$
Ia1.353 or Ib1.353	CHF_2	H	H	$OCOOC(CH_3)_3$
Ia1.354 or Ib1.354	CHF_2	H	H	$OCSOC_6H_5$
Ia1.355 or Ib1.355	CHF_2	H	H	$OCSN(CH_3)_2$
Ia1.356 or Ib1.356	CHF_2	H	H	$OCON(CH_3)_2$
Ia1.357 or Ib1.357	CHF_2	H	H	$OCOSCH_3$

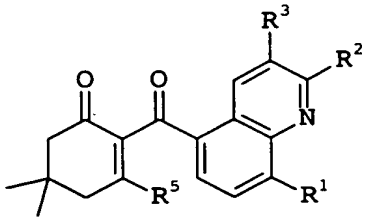
No.	R^1	R^2	R^3	R^5
Ia1.358 or Ib1.358	CHF_2	H	H	$ON(CH_3)_2$
Ia1.359 or Ib1.359	CHF_2	H	H	O-1-piperidyl
Ia1.360 or Ib1.360	CHF_2	H	H	$OCOCH_3$
Ia1.361 or Ib1.361	CHF_2	H	H	$OCOCH_2CH_3$
Ia1.362 or Ib1.362	CHF_2	H	H	$OCOCH(CH_3)_2$
Ia1.363 or Ib1.363	CHF_2	H	H	$OCOC(CH_3)_3$
Ia1.364 or Ib1.364	CHF_2	H	H	$OCO(CH_2)_6CH_3$
Ia1.365 or Ib1.365	CHF_2	H	H	$OCO(CH_2)_7CH_3$
Ia1.366 or Ib1.366	CHF_2	H	H	$OCO(CH_2)_{16}CH_3$
Ia1.367 or Ib1.367	CHF_2	H	H	$OCO(CH_2)_{14}CH_3$
Ia1.368 or Ib1.368	CHF_2	H	H	$OCOCH_2CH_2CH=CH_2$
Ia1.369 or Ib1.369	CHF_2	H	H	$OCO(CH_2)_3O(2,4\text{-}Cl_2\text{-}C_6H_3)$
Ia1.370 or Ib1.370	CHF_2	H	H	$OCOCH(CH_3)O\text{-}(2\text{-}CH_3\text{-}4\text{-}Cl\text{-}C_6H_3)$
Ia1.371 or Ib1.371	CHF_2	H	H	OCOcyclopropyl
Ia1.372 or Ib1.372	CHF_2	H	H	OCOcyclopentyl
Ia1.373 or Ib1.373	CHF_2	H	H	OCOcyclohexyl
Ia1.374 or Ib1.374	CHF_2	H	H	$OCOC_6H_5$
Ia1.375 or Ib1.375	CHF_2	H	H	OCO(2-tetrahydrofuryl)
Ia1.376 or Ib1.376	CHF_2	H	H	OCO(2-furyl)
Ia1.377 or Ib1.377	CHF_2	H	H	OCO(2-thienyl)
Ia1.378 or Ib1.378	CHF_2	H	H	OCO(3-pyridyl)
Ia1.379 or Ib1.379	CHF_2	H	H	OSO_2CH_5
Ia1.380 or Ib1.380	CHF_2	H	H	$OSO_2CH_2CH_3$
Ia1.381 or Ib1.381	Cl	CH_3	H	F
Ia1.382 or Ib1.382	Cl	CH_3	H	Cl
Ia1.383 or Ib1.383	Cl	CH_3	H	Br
Ia1.384 or Ib1.384	Cl	CH_3	H	I
Ia1.385 or Ib1.385	Cl	CH_3	H	SCH_3
Ia1.386 or Ib1.386	Cl	CH_3	H	SCH_2CH_3
Ia1.387 or Ib1.387	Cl	CH_3	H	$SCO(N(CH_3)_2)_2$
Ia1.388 or Ib1.388	Cl	CH_3	H	SO_2CH_3
Ia1.389 or Ib1.389	Cl	CH_3	H	$SO_2CH_2CH_3$
Ia1.390 or Ib1.390	Cl	CH_3	H	SC_6H_5
Ia1.391 or Ib1.391	Cl	CH_3	H	$S(4\text{-}CH_3\text{-}C_6H_4)$
Ia1.392 or Ib1.392	Cl	CH_3	H	$S(4\text{-}Cl\text{-}C_6H_4)$
Ia1.393 or Ib1.393	Cl	CH_3	H	$SO_2C_6H_5$
Ia1.394 or Ib1.394	Cl	CH_3	H	$SO_2(4\text{-}CH_3\text{-}C_6H_4)$
Ia1.395 or Ib1.395	Cl	CH_3	H	$SO_2(4\text{-}Cl\text{-}C_6H_4)$
Ia1.396 or Ib1.396	Cl	CH_3	H	4-morpholinyl
Ia1.397 or Ib1.397	Cl	CH_3	H	1-pyrrolidinyl
Ia1.398 or Ib1.398	Cl	CH_3	H	1-(1,2,4-triazolyl)

No.	R^1	R^2	R^3	R^5
Ia1.399 or Ib1.399	Cl	CH_3	H	1-imidazolyl
Ia1.400 or Ib1.400	Cl	CH_3	H	1-pyrazolyl
Ia1.401 or Ib1.401	Cl	CH_3	H	4-oxo-1,4-dihydro-1-pyridyl
Ia1.402 or Ib1.402	Cl	CH_3	H	$N(OCH_3)CH_3$
Ia1.403 or Ib1.403	Cl	CH_3	H	2-tetrahydroisoxazolyl
Ia1.404 or Ib1.404	Cl	CH_3	H	$N(CH_3)N(CH_3)_2$
Ia1.405 or Ib1.405	Cl	CH_3	H	$N(CH_2CH{=}CH_2)N(CH_3)_2$
Ia1.406 or Ib1.406	Cl	CH_3	H	$OPO(OCH_3)_2$
Ia1.407 or Ib1.407	Cl	CH_3	H	$OPO(OCH_2CH_3)_2$
Ia1.408 or Ib1.408	Cl	CH_3	H	$OPO(N(CH_3)_2)_2$
Ia1.409 or Ib1.409	Cl	CH_3	H	$OPO(OC_6H_5)_2$
Ia1.410 or Ib1.410	Cl	CH_3	H	$OPO(CH_3)_2$
Ia1.411 or Ib1.411	Cl	CH_3	H	$OPO(CH_2CH_3)_2$
Ia1.412 or Ib1.412	Cl	CH_3	H	$OPO(C_6H_5)_2$
Ia1.413 or Ib1.413	Cl	CH_3	H	$OPS(OCH_3)_2$
Ia1.414 or Ib1.414	Cl	CH_3	H	$OPS(OCH_2CH_3)_2$
Ia1.415 or Ib1.415	Cl	CH_3	H	$OP(OCH_3)_2$
Ia1.416 or Ib1.416	Cl	CH_3	H	$OP(OCH_2CH_3)_2$
Ia1.417 or Ib1.417	Cl	CH_3	H	$PO(OCH_3)_2$
Ia1.418 or Ib1.418	Cl	CH_3	H	$PO(OCH_2CH_3)_2$
Ia1.419 or Ib1.419	Cl	CH_3	H	$PO(C_6H_5)_2$
Ia1.420 or Ib1.420	Cl	CH_3	H	OCH_3
Ia1.421 or Ib1.421	Cl	CH_3	H	OCH_2CH_3
Ia1.422 or Ib1.422	Cl	CH_3	H	$OCH_2C_6H_5$
Ia1.423 or Ib1.423	Cl	CH_3	H	OCH_2(2-furyl)
Ia1.424 or Ib1.424	Cl	CH_3	H	OCH_2(3-furyl)
Ia1.425 or Ib1.425	Cl	CH_3	H	$OCOOCH_3$
Ia1.426 or Ib1.426	Cl	CH_3	H	$OCOOCH_2CH_3$
Ia1.427 or Ib1.427	Cl	CH_3	H	$OCOOCH(CH_3)_2$
Ia1.428 or Ib1.428	Cl	CH_3	H	$OCOOC_6H_5$
Ia1.429 or Ib1.429	Cl	CH_3	H	$OCOOC(CH_3)_3$
Ia1.430 or Ib1.430	Cl	CH_3	H	$OCSOC_6H_5$
Ia1.431 or Ib1.431	Cl	CH_3	H	$OCSN(CH_3)_2$
Ia1.432 or Ib1.432	Cl	CH_3	H	$OCON(CH_3)_2$
Ia1.433 or Ib1.433	Cl	CH_3	H	$OCOSCH_3$
Ia1.434 or Ib1.434	Cl	CH_3	H	$ON(CH_3)_2$
Ia1.435 or Ib1.435	Cl	CH_3	H	O-1-piperidyl
Ia1.436 or Ib1.436	Cl	CH_3	H	$OCOCH_3$
Ia1.437 or Ib1.437	Cl	CH_3	H	$OCOCH_2CH_3$
Ia1.438 or Ib1.438	Cl	CH_3	H	$OCOCH(CH_3)_2$
Ia1.439 or Ib1.439	Cl	CH_3	H	$OCOC(CH_3)_3$

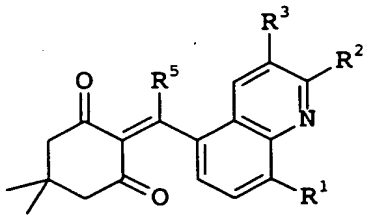
No.	R^1	R^2	R^3	R^5
Ia1.440 or Ib1.440	Cl	CH_3	H	$OCO(CH_2)_6CH_3$
Ia1.441 or Ib1.441	Cl	CH_3	H	$OCO(CH_2)_7CH_3$
Ia1.442 or Ib1.442	Cl	CH_3	H	$OCO(CH_2)_{16}CH_3$
Ia1.443 or Ib1.443	Cl	CH_3	H	$OCO(CH_2)_{14}CH_3$
Ia1.444 or Ib1.444	Cl	CH_3	H	$OCOCH_2CH_2CH=CH_2$
Ia1.445 or Ib1.445	Cl	CH_3	H	$OCO(CH_2)_3O(2,4\text{-}Cl_2\text{-}C_6H_3)$
Ia1.446 or Ib1.446	Cl	CH_3	H	$OCOCH(CH_3)O$-$(2\text{-}CH_3\text{-}4\text{-}Cl\text{-}C_6H_3)$
Ia1.447 or Ib1.447	Cl	CH_3	H	OCOcyclopropyl
Ia1.448 or Ib1.448	Cl	CH_3	H	OCOcyclopentyl
Ia1.449 or Ib1.449	Cl	CH_3	H	OCOcyclohexyl
Ia1.450 or Ib1.450	Cl	CH_3	H	$OCOC_6H_5$
Ia1.451 or Ib1.451	Cl	CH_3	H	OCO(2-tetrahydrofuryl)
Ia1.452 or Ib1.452	Cl	CH_3	H	OCO(2-furyl)
Ia1.453 or Ib1.453	Cl	CH_3	H	OCO(2-thienyl)
Ia1.454 or Ib1.454	Cl	CH_3	H	OCO(3-pyridyl)
Ia1.455 or Ib1.455	Cl	CH_3	H	OSO_2CH_3
Ia1.456 or Ib1.456	Cl	CH_3	H	$OSO_2CH_2CH_3$

Extraordinary preference is furthermore given to the following cyclohexenonequinolinoyl derivatives of the formula I:

- the compounds of the formulae Ia2 and Ib2, in particular the compounds Ia2.1 to Ia2.456 and the compounds Ib2.1 to Ib2.456, which differ from the compounds Ia1.1 to Ia1.456 and Ib1.1 to Ib1.456, respectively, in that $(R^6)_1$ is "5,5-dimethyl".

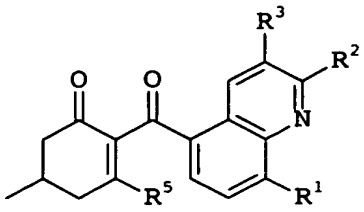


Ia2

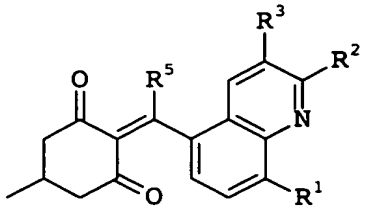


Ib2

- the compounds of the formulae Ia3 and Ib3, in particular the compounds Ia3.1 to Ia3.456 and the compounds Ib3.1 to Ib3.456, which differ from the compounds Ia1.1 to Ia1.456 and Ib1.1 to Ib1.456, respectively, in that $(R^6)_1$ is "5-methyl".

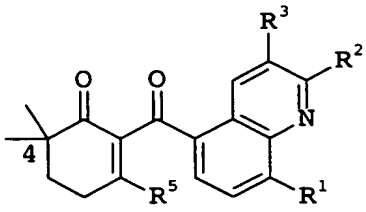


Ia3

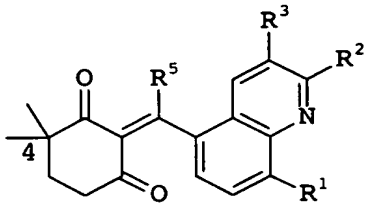


Ib3

- the compounds of the formulae Ia4 and Ib4, in particular the compounds Ia4.1 to Ia4.456 and the compounds Ib4.1 to Ib4.456, which differ from the compounds Ia1.1 to Ia1.456 and Ib1.1 to Ib1.456, respectively, in that $(R^6)_l$ is "4,4-dimethyl".

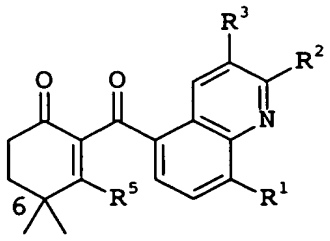


Ia4

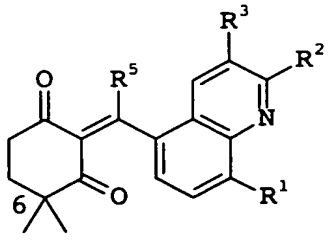


Ib4

- the compounds of the formulae Ia5 and Ib5, in particular the compounds Ia5.1 to Ia5.456 and the compounds Ib5.1 to Ib5.456, which differ from the compounds Ia1.1 to Ia1.456 and Ib1.1 to Ib1.456, respectively, in that $(R^6)_l$ is "6,6-dimethyl".

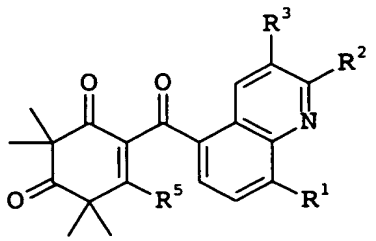


Ia5

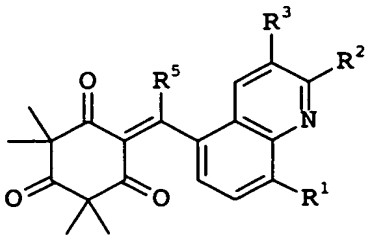


Ib5

- the compounds of the formulae Ia6 and Ib6, in particular the compounds Ia6.1 to Ia6.456 and the compounds Ib6.1 to Ib6.456, which differ from the compounds Ia1.1 to Ia1.456 and Ib1.1 to Ib1.456, respectively, in that $(R^6)_1$ is "4,4,6,6-tetramethyl-5-oxo".

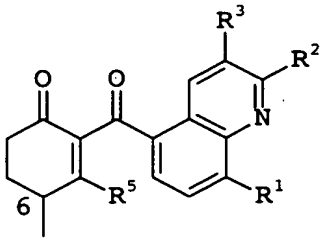


Ia6

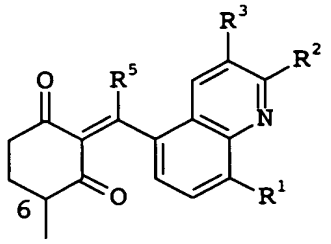


Ib6

- the compounds of the formulae Ia7 and Ib7, in particular the compounds Ia7.1 to Ia7.456 and the compounds Ib7.1 to Ib7.456, which differ from the compounds Ia1.1 to Ia1.456 and Ib1.1 to Ib1.456, respectively, in that $(R^6)_1$ is "6-methyl".

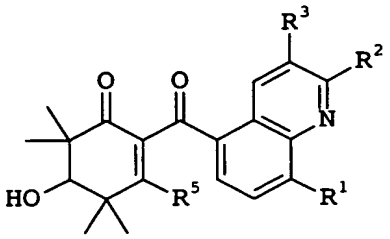


Ia7

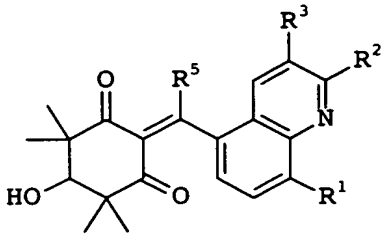


Ib7

- the compounds of the formulae Ia8 and Ib8, in particular the compounds Ia8.1 to Ia8.456 and the compounds Ib8.1 to Ib8.456, which differ from the compounds Ia1.1 to Ia1.456 and Ib1.1 to Ib1.456, respectively, in that $(R^6)_1$ is "5-hydroxy-4,4,6,6-tetramethyl".



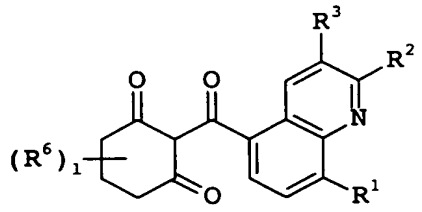
Ia8



Ib8

The cyclohexenonequinolinoyl derivatives of the formula I can be obtained by various routes, for example by the following processes:

A. Preparation of compounds of the formula I where R^5 = halogen by reaction of cyclohexanedione derivatives of the formula III with halogenating agents:

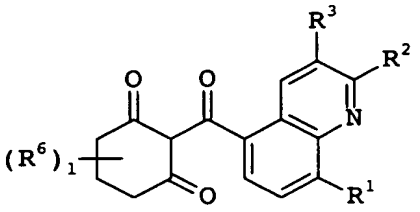


halogenating agent → Ia and/or Ib (where R^5 = halogen)

III

Suitable halogenating agents are, for example, phosgene, diphosgene, triphosgene, thionyl chloride, oxalyl chloride, phosphorus chloride, phosphorus pentachloride, mesyl chloride, chloromethylene-N,N-dimethylammonium chloride, oxalyl bromide, phosphorus oxybromide etc.

B. Preparation of compounds of the formula I where $R^5 = OR^7$, OSO_2R^8, OPR^8R^9, $OPOR^8R^9$ or $OPSR^8R^9$ by reaction of cyclohexane dione derivatives of the formula III with alkylating, sulfonylating or phosphonylating agents IVα, IVβ, IVγ, IVδ or IVε.



III

+ L^1-R^7 (IVα) or
L^1-SO_2R^8 (IVβ) or
L^1-PR^8R^9 (IVγ) or
L^1-POR^8R^9 (IVδ) or
L^1-PSR^8R^9 (IVε)

↓

Ia and/or Ib
(where R^5 = OR^7, OSO_2R^8, OPR^8R^9, $OPOR^8R^9$ or $OPSR^8R^9$)

L^1 is a nucleophilically replaceable leaving group, such as halogen, for example chlorine or bromine, hetaryl, for example imidazolyl, carboxylate, for example acetate, or sulfonate, for example mesylate or triflate, etc.

The compounds of the formula IVα, IVβ, IVγ, IVδ or IVε can be employed directly such as, for example, in the case of the carbonyl halides, or generated in situ, for example activated carboxylic acids (using carboxylic acid and dicyclohexyl carbodiimide, etc.).

C. Preparation of compounds of the formula I where R^5 = OR^7, SR^7, POR^8R^9, $NR^{10}R^{11}$, $ONR^{11}R^{12}$, N-linked heterocyclyl or O-(N-linked heterocyclyl) by reaction of compounds of the formula I where R^5 = halogen, OSO_2R^8 (Iα) with compounds of the formula Vα, Vβ, Vγ, Vδ, Vε, Vη or Vϑ, if appropriate in the presence of a base or with prior formation of salt.

Ia and/or Ib + HOR^7 (Vα) or HSR^7 (Vβ) or $HPOR^8R^9$ (Vγ) or $HNR^{10}R^{11}$ (Vδ) or $HONR^{11}R^{12}$ (Vε) or H(N-linked heterocyclyl) (Vη) or H(ON-linked heterocyclyl) (Vϑ)

(where R^5 = halogen, OSO_2R^8)

↓

Ia and/or Ib (where R^5 = OR^7, SR^7, POR^8R^9, $NR^{10}R^{11}$, $ONR^{11}R^{12}$, N-linked heterocyclyl or ON-linked heterocyclyl)

D. Preparation of compounds of the formula I where R^5 = SOR^8, SO_2R^8 by reaction of compounds of the formula I where R^5 = SR^8 (Iβ) with an oxidizing agent.

Ia and/or Ib (where R^5 = SR^8) —oxidizing agent→ Ia and/or Ib (where R^5 = SOR^8 or SO_2R^8)

Suitable oxidizing agents are, for example, m-chloroperbenzoic acid, peroxy acetic acid, trifluoroperoxy acetic acid, hydrogen peroxide, if appropriate in the presence of a catalyst such as tungstate.

The following conditions apply to the abovementioned reactions:

The starting materials are generally employed in equimolar amounts. However, it will also be advantageous to employ an excess of one or the other component.

If appropriate, it may be advantageous to carry out the reactions in the presence of a base. Here, the starting materials and the base are advantageously employed in equimolar amounts. An excess of base, for example 1.5 to 3 molar equivalents, based on Ia

and/or Ib (where R^5 = halogen or OSO_2R^8) or III may in certain cases be advantageous.

Suitable bases are tertiary alkyl amines, such as triethylamine, aromatic amines, such as pyridine, alkali metal carbonates, for example sodium carbonate or potassium carbonate, alkali metal bicarbonates, such as sodium bicarbonate and potassium bicarbonate, alkali metal alkoxides, such as sodium methoxide, sodium ethoxide, potassium tert-butoxide or alkali metal hydrides, for example sodium hydride. Preference is given to using triethylamine or pyridine.

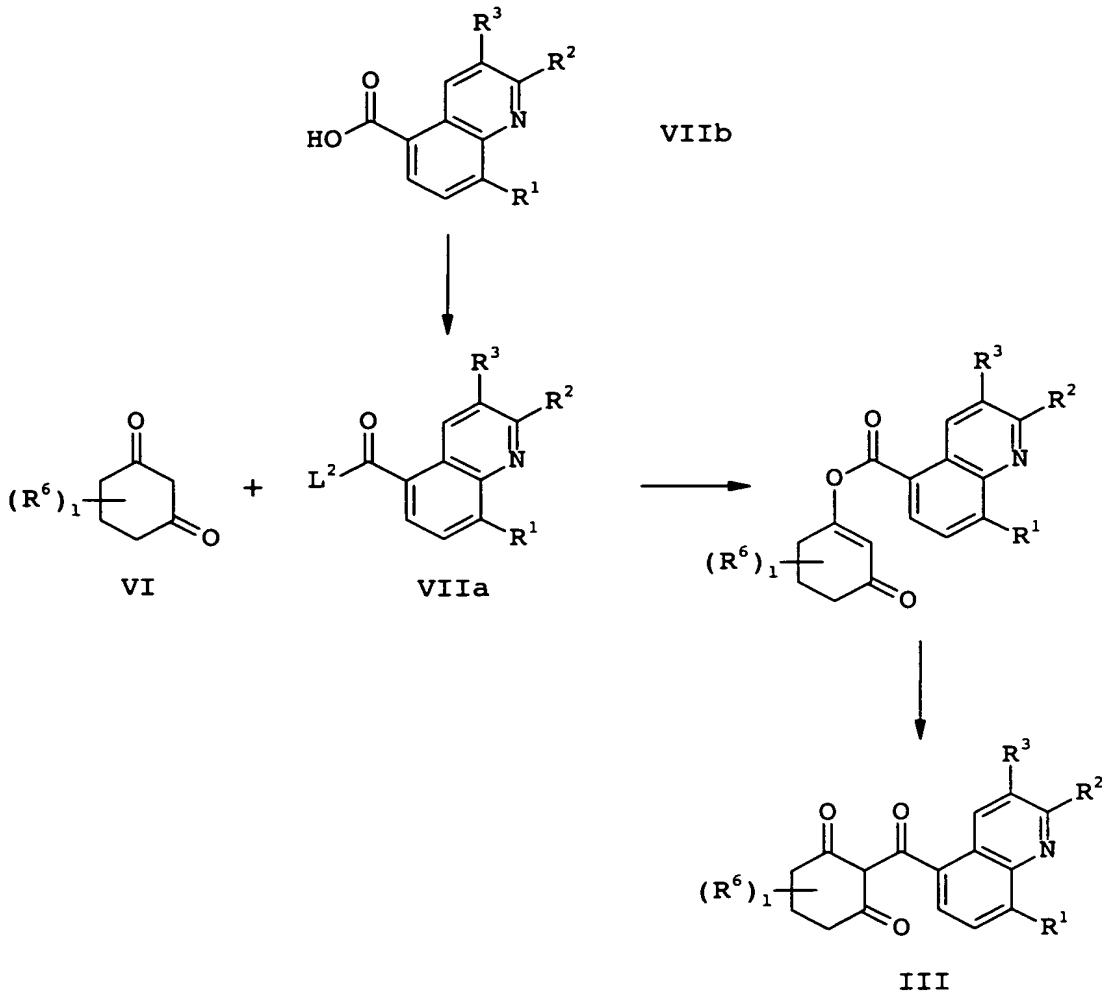
Suitable solvents are, for example, chlorinated hydrocarbons, such as methylene chloride or 1,2—dichloroethane, aromatic hydrocarbons, for example toluene, xylene or chlorobenzene, ethers, such as diethyl ether, methyl—tert—butyl ether, tetrahydrofuran or dioxane, polar aprotic solvents, such as acetonitrile, dimethyl formamide or dimethyl sulfoxide, or esters, such as ethyl acetate, or mixtures of these.

The reaction temperature is generally in the range of from 0°C to the boiling point of the reaction mixture.

Work-up to give the product can be carried out in a manner known per se.

Depending on the reaction conditions, the compounds Ia, Ib or mixtures of these can be formed. The latter can be separated by classical separation methods, such as, for example, crystallization, chromatography, etc.

The cyclohexanedione derivatives of the formula III are known or can be prepared by processes known per se (for example DE-A 19 532 311), for example by reacting cyclohexanones of the formula VI with an activated benzoic acid VIIa or a benzoic acid VIIb, which is preferably activated in situ, to give the acylation product which is subsequently rearranged.



VIIb

VI

VIIa

III

L^2 is a nucleophilically replaceable leaving group, such as halogen, for example bromine or chlorine, hetaryl, for example imidazolyl or pyridyl, carboxylate, for example acetate or trifluoroacetate, etc.

The activated benzoic acid VIIa can be employed directly, such as in the case of the benzoyl halides, or be generated in situ, for example using dicyclohexyl carbodiimide, triphenylphosphine/azodicarboxylic ester, 2-pyridine disulfide/triphenyl phosphine, carbonyldiimidazole, etc.

If appropriate, it may be advantageous to carry out the acylation reaction in the presence of a base. Here, the starting materials and the auxiliary base are advantageously employed in equimolar amounts. A slight excess of the auxiliary base, for exampl from 1.2 to 1.5 molar equivalents, based on VII, may be advantageous in certain cases.

Suitable auxiliary bases are tertiary alkyl amines, pyridine or alkali metal carbonates. Suitable solvents are, for example, chlorinated hydrocarbons, such as methylene chloride or 1,2-dichloroethane, aromatic hydrocarbons, such as toluene, xylene or chlorobenzene, ethers, such as diethyl ether, methyl tert-butyl ether, tetrahydrofuran or dioxane, polar aprotic solvents, such as acetonitrile, dimethylformamide or dimethyl sulfoxide, or esters, such as ethyl acetate, or mixtures of these.

If the activated carboxylic acid component employed is a benzoyl halide, it may be advantageous to cool the reaction mixture to 0—10°C on addition of this reaction partner. The mixture is subsequently stirred at 20 — 100°C, preferably at 25 — 50°C, until the reaction is complete. Work-up is carried out in a customary manner, for example the reaction mixture is poured into water and the product of value is extracted. Solvents which are suitable for this purpose are, in particular, methylene chloride, diethyl ether and ethyl acetate. The organic phase is dried and the solvent is removed, after which the crude ester can be employed without any further purification for the rearrangement.

The rearrangement of the esters to the compounds of the formula III is advantageously carried out at 20 - 100°C in a solvent and in the presence of a base and, if appropriate, with the aid of a cyano compound as catalyst.

Suitable solvents are, for example, acetonitrile, methylene chloride, 1,2-dichloroethane, dioxane, ethyl acetate, toluene or mixtures of these. Preferred solvents are acetonitrile and dioxane.

Suitable bases are tertiary amines, such as triethylamine, aromatic amines, such as pyridine, or alkali metal carbonates, such as sodium carbonate or potassium carbonate, which are preferably employed in an equimolar amount, or up to a four-fold excess, based on the ester. Preference is given to using triethylamine or alkali metal carbonate, preferably in twice the equimolar amount, based on the ester.

Suitable cyano compounds are inorganic cyanides, such as sodium cyanide or potassium cyanide, and organic cyano compounds, such as acetone cyanohydrin or trimethylsilyl cyanide. They are employed in an amount from 1 to 50 mol percent, based on the ester. Preference is given to using acetone cyanohydrin or

trimethylsilyl cyanide, for example in an amount from 5 to 15, preferably 10, mol percent, based on the ester.

Work-up can be carried out in a manner known per se. For example, the reaction mixture is acidified with dilute mineral acid, such as 5% strength hydrochloric acid, or sulfuric acid, and extracted with an organic solvent, for example methylene chloride or ethyl acetate. The organic extract can be extracted with 5–10% strength alkali metal carbonate solution, for example sodium carbonate or potassium carbonate solution. The aqueous phase is acidified and the resulting precipitate is filtered off with suction and/or extracted with methylene chloride or ethyl acetate, dried and concentrated.

The benzoyl halides of the formula VIIa (where L^2 = Cl, Br) can be prepared in a manner known per se by reaction of the benzoic acids of the formula VIIb with halogenating agents, such as thionyl chloride, thionyl bromide, phosgene, diphosgene, triphosgene, oxalyl chloride, oxalyl bromide.

The benzoic acids of the formula VIIb can be prepared in a known manner from the corresponding esters by acidic or basic hydrolysis. The latter are known from the literature or can be prepared in a manner known per se.

8-Difluoromethyl-5-alkoxycarbonyl-quinolines can be obtained from the corresponding 8-aldehyde derivatives by fluorination. A suitable fluorinating agent is, inter alia, DAST. The formyl quinoline is obtained by oxidation of the corresponding bromomethyl quinoline.

Furthermore, it is possible to obtain 8-difluoromethoxy-5-alkoxycarbonyl-quinolines from the corresponding 8-hydroxy derivatives by reaction with chlorodifluoromethane. This reaction is preferably carried out in the presence of a base, such as potassium hydroxide or sodium hydroxide, in an aprotic solvent. The 8-hydroxy-5-alkoxycarbonylquinolines are obtained from 8-hydroxy-5-hydroxycarbonyl-quinoline by esterification reactions which are known per se.

Preparation examples:

2-[(8-Chloroquinolin-5-yl)carbonyl]-1-chloro-4,4,6,6-tetramethyl-cyclohex-1-ene-3,5-dione (Compound 2.22) and
2-[(8-chloroquinolin-5-yl)chloromethylidene]-4,4,6,6-tetramethyl-cyclohexane-1,3,5-trione (Compound 3.1)

4.0 g (10.8 mmol) of 2-(8-chloroquinolin-5-yl)carbonyl-4,4,6,6-tetramethylcyclohexane-1,3,5-trione were dissolved in 40 ml of dichloromethane, and 4.1 g (32.4 mmol) of oxalyl chloride and 1.5 ml of dimethylformamide were added. The mixture was stirred at 25°C for 1.5 hours, after which the solvent was removed. This gave 3.9 g of colorless crystals. Silica gel chromatography (mobile phase: toluene/methyl-tert-butyl ether) gave:
2-[(8-chloroquinolin-5-yl)carbonyl]-1-chloro-4,4,6,6-tetramethylcyclohex-1-ene-3,5-dione: Yield 0.65 g (colorless crystals); m.p.: 180°C;
2-[(8-chloroquinolin-5-yl)chloromethylidene-4,4,6,6-tetramethyl-cyclohexane-1,3,5-trione: Yield: 0.35 g (colorless crystals); m.p.: 156°C.

2-[(8-Chloroquinolin-5-yl)-1-(4'-oxo-1',4'-dihydropyrid-1'-yl)-4,4,6,6-tetramethyl-cyclohex-1-ene-3,5-dione (Compound 2.46) and
2-[(8-chloroquinolin-5-yl)-(4'-oxo-1',4'-dihydropyrid-1'-yl)-methylidene]-4,4,6,6-tetramethyl-cyclohexane-1,3,5-trione (Compound 3.5)

1.0 g (2.6 mmol) of a mixture of the compounds 2.22 and 3.1 was dissolved in 25 ml of methylene chloride, 0.82 g (8.7 mmol) of 4-hydroxypyridine were added and the mixture was stirred at 40°C for 8 hours. Insoluble components were subsequently filtered off, the solvent was removed and the residue was chromatographed over silica gel (mobile phase: methylene chloride/methanol). This gave: 2-[(8-chloroquinolin-5-yl)-4'-oxo-1',4'-dihydropyridin-1'-yl)methylidene-4,4,6,6-tetramethylcyclohexane-1,3,5-trione: Yield 0.40 g (colorless oil);
2-[(8-chloroquinolin-5-yl)carbonyl]-1-(4'-oxo-1',4'-dihydro-pyrid-1'-yl)-4,4,6,6-tetramethylcyclohex-1-ene-3,5-dione: Yield 0.25 g (colorless crystals); m.p. > 210°C.

2-(8-fluoroquinolin-5-yl)carbonyl-1,5-di(ethoxycarbonyloxy)-4,4,6,6-tetramethyl-cyclohex-1-ene-3,5-dione (Compound 3.20)

0.12 g (4 mmol) of sodium hydride was dissolved in 10 ml of tetrahydrofuran, 0.36 g (1 mmol) of 2-[(8-fluoroquinolin-5-yl)carbonyl]-4,4,6,6-tetramethyl-1-hydroxy-cyclohexane-3,5-dione in 5 ml of tetrahydrofuran was added dropwise at room temperature and the mixture was stirred at 40°C for 1 hour. At room temperature, 0.43 g (4 mmol) of ethyl chloroformate were subsequently added dropwise, and the mixture was heated under reflux for 3 hours. After cooling, water was added and the mixture was extracted with ethyl acetate, the organic phase was washed with 2% strength potassium carbonate solution and water and dried and the solvent was removed. This gave 0.45 g of a colorless oil).

2-[(8-Chloroquinolin-5-yl)carbonyl]-1-[(dimethylamino)carbonyl-thio]-4,4,6,6-tetramethyl-cyclo-hex-1-ene-3,5-dione (Compound 2.45) and
2-{(8-chloroquinolin-5-yl)-[(dimethylamino)carbonylthio]-methylidene}-4,4,6,6-tetramethylcyclohexane-1,3,5-trione (Compound 3.4)

0.50 g (1.3 mmol) of 2-[(8-chloroquinolin-5-yl)carbonyl]-4,4,6,6-tetramethyl-cyclohexane-1,3,5-trione was dissolved in 15 ml of tetrahydrofuran, 0.52 g (5.2 mmol) of triethylamine was added and 0.32 g (2.6 mmol) of dimethylaminothiocarbonyl chloride in 5 ml of tetrahydrofuran was added dropwise. The mixture was stirred at room temperature for 30 hours, the solvent was removed, and the residue was taken up in the ethyl acetate, washed with 5% strength potassium carbonate solution and water, dried, concentrated and chromatographed over silica gel using cyclohexane/ethyl acetate. This gave
2-[(8-chloroquinolin-5-yl)carbonyl]-1-[(dimethylamino)carbonyl-thio]-4,4,6,6-tetramethyl-cyclohex-1-ene-3,5-dione: Yield 0.5 g (colorless crystals); m.p. 138°C;
2-{(8-chloroquinolin-5-yl)-[(dimethylamino)carbonyl-thio]methyl-idene}-4,4,6,6-tetramethylcyclohexane-1,3,5-trione: Yield: 0.2 g (colorless crystals) m.p. 75°C.

2-[(8-difluoromethylquinolin-5-yl)carbonyl]-1-chloro-4,4,6,6-tetramethyl-cyclohex-1-ene-3,5-dione (Compound 2.31)

Step a) Methyl 8-formyl-5-quinolinecarboxylate

28.8 g (103 mmol) of 8-(bromomethyl)-5-quinolinecarboxylate were dissolved in 200 ml of acetonitrile, 36.1 g (309 mmol) of N-methylmorpholine N-oxide were added, the mixture was stirred at 25°C for 7 hours and the solvent was then removed. Silica gel

chromatography (mobile phase: cyclohexane/ethyl acetate) gave 12.0 g of methyl 8-formyl-5-quinolinecarboxylate (colorless crystals), m.p.: 128°C.

Step b) 8-difluoromethyl-5-quinolinecarboxylate

0.5 g (2.3 mmol) of methyl 8-formyl-5-quinolinecarboxylate was dissolved in 50 ml of dichloroethane and, at -20°C, 1.1 g (6.8 mmol) of diethylaminosulfur trifluoride (DAST) were added dropwise. The mixture was stirred at -20°C for 30 min and then warmed to 25°C, and 50 ml of water were added dropwise. The aqueous phase was extracted with methylene chloride, the combined organic phases were washed with sodium bicarbonate solution and dried and the solvent was removed. Yield: 0.7 g of colorless crystals;

^{1}H-NMR (δ in ppm, d^6-DMSO): 9.28 (d,1H); 9.04 (s, 1H); 8.36 (d, 1H); 8.11 (d, 1H); 7.90 (t, 1H); 7.80 (brd s, 1H); 3.96 (s,3H).

Step c) 8-difluoromethyl-5-quinolinecarboxylic acid

0.5 g (2.0 mmol) of methyl 8-difluoromethyl-5-quinoline-carboxylate was dissolved in 5 ml of ethanol, 0.43 g (10.5 mmol) of sodium hydroxide and 1 ml of water were added, and the mixture was stirred at 25°C for 20 hours. The solvents were subsequently removed, the residue was taken up in water, washed twice with methylene chloride and adjusted to pH 1 using 10 N hydrochloric acid, and the precipitate was filtered off with suction. Drying gave 0.5 g of 8-difluoromethyl-5-quinolinecarboxylic acid (colorless crystals);

^{1}H-NMR (δ in ppm, d^6-DMSO): 9.35 (d,1H); 9.04 (s, 1H); 8.38 (d, 1H); 8.10 (d, 1H); 7.92 (t, 1H); 7.78 (brd s, 1H).

Step d) 2-[(8-difluoromethylquinolin-5-yl)carbonyl]-4,4,6,6-tetramethylcyclohexane-1,3,5-trione

0.26 g (1.4 mmol) of 2,2,4,4-tetramethylcyclohexane-1,3,5-trione was dissolved in 10 ml of acetonitrile, 0.34 g (1.4 mmol) of 8-difluoromethyl-5-quinolinecarboxylic acid and 0.38 g (1.9 mmol) of dicyclohexylcarbodiimide were added and the mixture was stirred at 25°C for 17 hours. 0.57 g (5.6 mmol) of triethylamine and 5 drops of trimethylsilyl cyanide were then added to the suspension, and stirring was continued at 25°C for a further 25 hours. 50 ml of 5% strength potassium carbonate solution were subsequently added, the mixture was filtered, the filtrate was washed with methyl tert-butyl ether, the aqueous phase was

adjusted to pH 2 using concentrated hydrochloric acid and the precipitate was filtered off, washed with water and dried. Yield: 0.25 g (colorless crystals);
^{1}H-NMR (δ in ppm, $CDCl_3$): 17.5 (s,1H); 9.02 (q, 1H); 8.24 (d, 1H); 8.06 (d, 1H); 7.82 (t, 1H); 7.50 (m, 2H); 1.60 (s,6H); 1.36 (s, 6H).

Step e) 2-[(8-Difluoromethylquinolin-5-yl)carbonyl]-1-chloro-4,4,6,6-tetramethyl-cyclohex-1-ene-3,5-dione (Compound 2.31)

0.25 g (0.65 mmol) of 2-(8-difluoromethylquinolin-5-yl)carbonyl-4,4,6,6-tetramethyl-cyclohexane-1,3,5-trione was dissolved in 15 ml of dichloromethane and 0.25 g (1.95 mmol) of oxalyl chloride and 7 drops of dimethylformamide were added. The mixture was stirred at 25°C for 17 hours, after which the solvent was removed. This gave 0.2 g of colorless crystals.

Preparation of the precursor 2-[(8-difluoromethoxyquinolin-5-yl)carbonyl]-4,4,6,6-tetramethylcyclohexane-1,3,5-trione

Step a) Methyl 8-hydroxy-5-quinolincarboxylate

16.25 g (86 mmol) of 8-hydroxy-5-quinolinecarboxylic acid were dissolved in 70 ml of methanol, 3 ml of concentrated sulfuric acid were added and the mixture was heated under reflux for 25 hours. The solvent was then removed and the residue was taken up in ice-water, adjusted to a pH of 8 using sodium carbonate solution and filtered hot. The residue was extracted with methyl-tert-butyl ether for 7 hours on a jacketed Soxhlet extractor, and the solvent was subsequently removed from the extract. This gave 6.8 g of a brown powder;
^{1}H-NMR (δ in ppm, d^6-DMSO): 9.38 (d, 1H); 8.90 (d, 1H); 8.26 (d, 1H); 7.71 (dd, 1H); 7.15 (d, 1H); 3.93 (s, 3H).

Step b) Methyl 8-difluoromethoxy-5-quinolinecarboxylate

1.0 g (5.0 mmol) of methyl 8-hydroxy-5-quinolinecarboxylate was dissolved in 20 ml of dimethylformamide, 0.76 g (5.5 mmol) of potassium carbonate was added and 14 g of chlorodifluoromethane were introduced at 40°C over a period of 2 hours. Solid components were then filtered off, the solvent was removed and the residue was washed with water and dried. This gave 0.75 g of a brown powder;

^{1}H-NMR (δ in ppm, $CDCl_3$): 9.45 (d,1H); 9.00 (d, 1H); 8.30 (d, 1H); 7.61 (dd, 1H); 7.49 (d, 1H); 7.18 (t, 1H); 3.99 (s, 3H).

Step c) 8-difluoromethoxy-5-quinolinecarboxylic acid

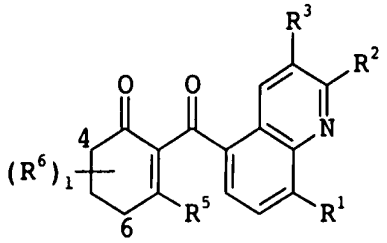
0.7 g (2.8 mmol) of methyl 8-difluoromethoxy-5-quinolinecarboxylate was suspended in 15 ml of water and 0.4 g (10 mmol) of sodium hydroxide was added. The mixture was stirred at 25°C for 20 hours and then filtered off, and the filtrate was washed with methyl tert-butyl ether. The aqueous phase was adjusted to pH 3 using concentrated hydrochloric acid and filtered off, and the residue was dried. This gave 0.45 g of a colorless powder;
^{1}H-NMR (δ in ppm, d^6-DMSO): 13.5 (br, 1H); 9.39 (d, 1H); 9.03 (d, 1H); 8.32 (d, 1H); 7.78 (dd, 1H); 7.62 (d, 1H); 7.60 (t, 1H).

Step d) 2-[(8-difluoromethoxyquinolin-5-yl)carbonyl]-4,4,6,6-tetramethylcyclohexane-1,3,5-trione

0.4 g (1.7 mmol) of 8-difluoromethoxy-5-quinolinecarboxylic acid was dissolved in 20 ml of acetonitrile, 0.4 g (1.9 mmol) of N,N-dicyclohexylcarbodiimide and 0.3 g (1.7 mmol) of 2,2,4,4-tetramethylcyclohexane-1,3,5-trione were added and the mixture was stirring at 25°C for 20 hours. 0.4 g (4.0 mmol) of triethylamine and 2 drops of trimethylsilyl cyanide were then added, and stirring was continued at 30-35°C for a further 3 hours. The precipitate was filtered off, and the filtrate was concentrated, 20 ml of 5% strength potassium carbonate solution were added and the mixture was washed with methyl tert-butyl ether. The aqueous phase was subsequently adjusted to pH 3 using concentrated hydrochloric acid and extracted with ethyl acetate. The solvent was removed and the residue was chromatographed over silica gel (mobile phase: methylene chloride/methanol). This gave 0.2 g of a colorless powder;
^{1}H-NMR (δ in ppm, $CDCl_3$): 16.5 (br, 1H); 9.02 (d, 1H); 8.30 (d, 1H); 7.51 (m, 2H); 7.21 (d, 1H); 7.17 (t, 1H); 1.60 (s, 6H); 1.35 (s, 6H).

In addition to the cyclohexenone quinolinoyl derivatives of the formula I described above, further derivatives which were prepared or are preparable in a similar manner or in a manner known per se are listed in Tables 2 and 3:

Table 2:



Ia

No.	R^1	R^2	R^3	R^5	$(R^6)_1$	m.p. [°C] or ^{1}H-NMR [ppm]
2.1	F	H	H	$OCOC_6H_5$	4,4,6,6-$(CH_3)_4$-5-oxo	178
2.2	F	H	H	$OCOC(CH_3)_3$	4,4,6,6-$(CH_3)_4$-5-oxo	9.22(d, 1H); 9.03 (d, 1H); 7.98 (q, 1H); 7.62 (q, 1H); 7.39 (t, 1H); 1.49 (s, 6H); 1.40 (s, 6H); 1.11 (s, 9H)
2.3	Cl	H	H	$OCOC_6H_5$	4,4,6,6-$(CH_3)_4$-5-oxo	>200
2.4	Cl	H	H	$OCOC(CH_3)_3$	4,4,6,6-$(CH_3)_4$-5-oxo	9.20 (dd, 2H); 8.85 (q, 2H); 7.60 (q, 1H); 1.40 (s, 12H); 1.12 (s, 9H)
2.5	CH_3	H	H	$OPS(OCH_2CH_3)_2$	4,4,6,6-$(CH_3)_4$-5-oxo	9.50 (d, 1H); 8.98 (d, 1H); 8.06 (d, 1H); 7.60 (m, 2H); 3.95 (m, 4H); 2.90 (s, 3H); 1.65 (s, 6H); 1.51 (s, 6H)
2.6	CH_3	H	H	$OCOSCH_3$	4,4,6,6-$(CH_3)_4$-5-oxo	128
2.7	CH_3	H	H	$OCSN(CH_3)_2$	4,4,6,6-$(CH_3)_4$-5-oxo	163

No.	R^1	R^2	R^3	R^5	$(R^6)_1$	m.p. [°C] or ^{1}H-NMR [ppm]
2.8	CH_3	H	H	$OCOC_6H_5$	4,4,6,6-$(CH_3)_4$-5-oxo	9.05 (d, 1H); 9.85 (d, 1H); 7.92 (d, 1H); 7.72 (d, 2H); 7.51 (d, 1H); 7.48 (t, 1H); 7.35 (q, 1H); 7.28 (t, 2H); 2.79 (s, 3H); 1.62 (s, 6H); 1.55 (s, 6H)
2.9	CH_3	H	H	$OPO[N(CH_3)]_2$	4,4,6,6-$(CH_3)_4$-5-oxo	9.41 (d, 1H); 8.95 (d, 1H); 8.07 (d, 1H); 7.58 (d, 1H); 7.50 (q, 1H); 2.88 (s, 3H); 2.45 (s, 6H); 2.42 (s, 6H); 1.65 (s, 6H); 1.48 (s, 6H)
2.10	CH_3	H	H	$OCO(CH_2)_3O$(2,4-Cl2-C_6H_3)	4,4,6,6-$(CH_3)_4$-5-oxo	oil
2.11	CH_3	H	H	$OCOCH(CH_3)O$(2-CH_3-4-Cl-C_6H_3)	4,4,6,6-$(CH_3)_4$-5-oxo	oil
2.12	CH_3	H	H	$OCOC(CH_3)_3$	4,4,6,6-$(CH_3)_4$-5-oxo	9.20 (d, 1H); 8.85 (d, 1H); 7.80 (d, 1H); 7.51 (d, 1H); 7.48 (q, 1H); 2.85 (s, 3H); 1.55 (s, 6H); 1.50 (s, 6H); 1.08 (s, 9H)
2.13	F	H	H	$OCOC(CH_3)_3$	4,4,6-$(CH_3)_3$	oil
2.14	Cl	H	H	$OCOCH_2CH_3$	4,4,6,6-$(CH_3)_4$-5-oxo	9.13 (d, 1H); 9.02 (d, 1H); 7.85 (s, 2H); 7.58 (q, 1H); 2.40 (q, 2H);1.60 (s, 6H); 1.50 (s, 6H); 1.05 (t, 3H)
2.15	F	H	H	$OCOSCH_3$	4,4,6,6-$(CH_3)_4$-5-(OH)	190-192
2.16	Cl	H	H	$OCOSCH_3$	4,4,6,6-$(CH_3)_4$-5-oxo	84
2.17	F	H	H	$OCOSCH_3$	4,4,6,6-$(CH_3)_4$-5-oxo	72

No.	R^1	R^2	R^3	R^5	$(R^6)_1$	m.p. [°C] or ^{1}H-NMR [ppm]
2.18	CH_3	H	H	OCH_3	4,4,6,6-$(CH_3)_4$-5-oxo	9.44 (d, 1H); 9.03 (d, 1H); 7.88 (d, 1H); 7.59 (m, 2H); 3.92 (s, 3H); 2.90 (s, 3H); 1.50 (s, 6H); 1.38 (s, 6H)
2.19	F	H	H	OSO_2CH_3	4,4,6,6-$(CH_3)_4$-5-(OH)	9.30 (d, 1H); 9.02 (d, 1H); 7.93 (q, 1H); 7.61 (q, 1H); 7.40 (q, 1H); 3.01 (s, 3H); 1.57 (s, 3H); 1.53 (s, 3H); 1.32 (s, 3H); 1.28 (s, 3H)
2.20	F	H	H	$OCOOCH_2CH_3$	4,4,6,6-$(CH_3)_4$-5-($OCOOCH_2CH_3$)	9.18 (d, 1H); 9.02 (s, 1H); 7.92 (q, 1H); 7.65 (q, 1H); 7.41 (q, 1H); 4.32 (q, 2H); 4.11 (q, 1H); 1,45 (s, 3H); 1.40 (s, 3H); 1.38 (s, 3H); 1.30 (s, 3H); 1.22 (s, 3H); 1.15 (s, 3H)
2.21	F	H	H	OCH_3	4,4,6,6-$(CH_3)_4$-5-oxo	9.45 (d, 1H); 9.03 (d, 1H); 7.96 (q, 1H); 7.68 (q, 1H); (7.40 (t, 1H); 3.88 (s, 3H); 1.50 (s, 6H); 1.39 (s, 6H)
2.22	Cl	H	H	Cl	4,4,6,6-$(CH_3)_4$-5-oxo	180
2.23	F	H	H	Cl	4,4,6,6-$(CH_3)_4$-5-oxo	152
2.24	Cl	H	H	S(4-CH_3-C_6H_4)	4,4,6,6-$(CH_3)_4$-5-oxo	119
2.25	S(4-CH_3-C_6H_4)	H	H	S(4-CH_3-C_6H_4)	4,4,6,6-$(CH_3)_4$-5-oxo	132-135
2.26	Cl	H	H	Cl	4,4,6,6-$(CH_3)_4$-5-oxo	

No.	R^1	R^2	R^3	R^5	$(R^6)_1$	m.p. [°C] or ^{1}H-NMR [ppm]
2.27	O(tetrahydrofuran-3-yl)	H	H	Cl	4,4,6,6-$(CH_3)_4$-5-oxo	9.65 (d, 1H); 9.05 (d, 1H); 8.83 (d, 1H); 7.66 (q, 1H); 6.95 (d, 1H); 5.23 (m, 1H); 4.21 (d, 2H); 4.05 (m, 2H); 2.39 (m, 2H); 1.62 (s, 6H); 1.48 (s, 6H)
2.28	CH_3	H	H	Cl	4,4,6,6-$(CH_3)_4$-5-oxo	194
2.29	F	H	H	Cl	4,4,6-$(CH_3)_3$	oil
2.30	CH_3	H	H	Br	4,4,6,6-$(CH_3)_4$-5-oxo	oil
2.31	CHF_2	H	H	Cl	4,4,6,6-$(CH_3)_4$-5-oxo	9.40 (d, 1H); 9.05 (d, 1H); 8.05 (d, 1H); 7.86 (t, 1H); 7.80 (d, 1H); 7.65 (q, 1H); 1.59 (s, 6H); 1.48 (s, 6H)
2.32	CF_3	H	H	Cl	4,4,6,6-$(CH_3)_4$-5-oxo	oil
2.33	CF_3	CH_3	H	Cl	5,5-$(CH_3)_2$	9.15 (d, 1H); 8.10 (d, 1H); 7.75 (d, 1H); 7.52 (d, 1H); 3.02 (s, 2H); 2.91 (s, 2H); 2.80 (s, 3H); 1.20 (s, 6H)
2.34	CH_3	H	H	N$(CH_3)OCH_3$	4,4,6,6-$(CH_3)_4$-5-oxo	oil
2.35	CH_3	H	H	SCH_3	4,4,6,6-$(CH_3)_4$-5-oxo	9.50 (d, 1H); 9.02 (d, 1H); 7.80 (d, 1H); 7.50 (m, 3H); 2.90 (s, 3H); 2.30 (s, 3H); 1.50 (s, 6H); 1.35 (s, 3H); 1.25 (s, 3H)
2.36	Cl	H	H	1-pyrazolyl	4,4,6,6-$(CH_3)_4$-5-oxo	9.30 (d, 1H); 9.05 (d, 1H); 7.80 (d, 1H); 7.75 (d, 1H); 7.61 (q, 1H); 7.52 (d, 1H); 7.40 (s, 1H); 6.11 (s, 1H); 1.65 (s, 3H); 1.60 (s, 3H); 1.50 (s, 6H)
2.37	Cl	H	H	N$(CH_3)OCH_3$	4,4,6,6-$(CH_3)_4$-5-oxo	190

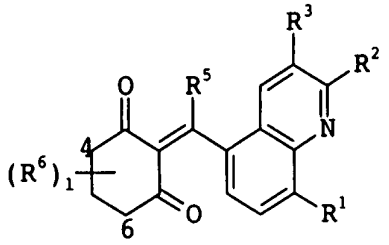
No.	R^1	R^2	R^3	R^5	$(R^6)_1$	m.p. [°C] or ^{1}H-NMR [ppm]
2.38	CH_3	H	H	1-pyrolidinyl	4,4,6,6-$(CH_3)_4$-5-oxo	oil
2.39	CH_3	H	H	4-morpholinyl	4,4,6,6-$(CH_3)_4$-5-oxo	205
2.40	Cl	H	H	4-morpholinyl	4,4,6,6-$(CH_3)_4$-5-oxo	205
2.41	CH_3	H	H	Cl	4,4,6,6-$(CH_3)_4$-5-oxo	194
2.42	CH_3	H	H	1-pyrazolyl	4,4,6,6-$(CH_3)_4$-5-oxo	150
2.43	CF_3	H	H	4-morpholinyl	4,4,6,6-$(CH_3)_4$-5-oxo	oil
2.44	$CHNOCH_3$	H	H	Cl	4,4,6,6-$(CH_3)_4$-5-oxo	oil
2.45	Cl	H	H	$SCON(CH_3)_2$	4,4,6,6-$(CH_3)_4$-5-oxo	138
2.46	Cl	H	H	4-oxo-1,4-dihydro-pyrid-1-yl	4,4,6,6-$(CH_3)_4$-5-oxo	>210
2.47	F	H	H	Cl	4,6-$(CH_3)_2$-4-SCH_3	oil
2.48	CH_3	H	H	$SCON(CH_3)_2$	4,4,6,6-$(CH_3)_4$-5-oxo	166
2.49	CH_3	H	H	$OP(OCH_2CH_3)_2$	4,4,6,6-$(CH_3)_4$-5-oxo	9.65 (d, 1H); 8.97 (d, 1H); 7.79 (d, 1H); 7.60 (m, 2H); 4.00 (m, 4H); 2.91 (s, 3H); 1.71 (s, 6H); 1.51 (s, 6H)
2.50	OCH_3	H	H	Cl	4,4,6,6-$(CH_3)_4$-5-oxo	9.65 (d, 1H); 9.01 (d, 1H); 7.83 (d, 1H); 7.65 (q, 1H); 7.02 (d, 1H); 4.18 (s, 3H); 1.65 (s, 6H); 1.55 (s, 6H)

No.	R^1	R^2	R^3	R^5	$(R^6)_1$	m.p. [°C] or ^{1}H-NMR [ppm]
2.51	F	H	H	$OCOS(CH_2)_7CH_3$	4,4,6,6-$(CH_3)_4$-5-oxo	9.20 ((d, 1H); 9.02 (d, 1H); 7.89 (q, 1H); 7.60 (q, 1H); 7.40 (t, 1H); 2.62 (t, 2H); 1.55 (s, 6H); 1.48 (s, 6H); 1.1-1.5 (m, 12H); 0.85 (t, 3H)
2.52	F	H	H	Cl	4,6-(ethan-1,2-diyl)[1)]	9.55 (d, 1H); 9.02 (d, 1H); 7.78 (q, 1H); 7.65 (q, 1H); 7.40 (t, 1H); 3.24 (m, 1H); 3.17 (m, 1H); 2.41 (d, 1H); 1.8-2.4 (m, 5H)
2.53	SCH_3	H	H	$OCOSCH_3$	4,4,6,6-$(CH_3)_4$-5-oxo	147
2.54	F	H	H	$OCOSCH_2CH_3$	4,4,6,6-$(CH_3)_4$-5-oxo	107
2.55	Br	H	H	$OCOC(CH_3)_3$	4,4,6,6-$(CH_3)_4$-5-oxo	134
2.56	Br	H	H	$OCO(C_6H_5)$	4,4,6,6-$(CH_3)_4$-5-oxo	228
2.57	Cl	H	H	F	4,4,6,6-$(CH_3)_4$-5-oxo	181
2.58	F	H	H	SO_2CH_3	4,4,6,6-$(CH_3)_4$-5-oxo	206
2.59	F	H	H	$SOCH_3$	4,4,6,6-$(CH_3)_4$-5-oxo	190
2.60	SCH_2F	H	H	F	4,4,6,6-$(CH_3)_4$-5-oxo	9.50 (d, 1H); 9.00 (d, 1H); 7.81 (s, 2H); 7.65 (g, 1H); 6.01 (d, 2H); 1.60 (s, 6H); 1.51 (s, 6H)
2.61	F	H	H	SC_6H_5	4,4,6,6-$(CH_3)_4$-5-oxo	65
2.62	F	H	H	$SO_2C_6H_5$	4,4,6,6-$(CH_3)_4$-5-oxo	111
2.63	F	H	H	SCH_3	4,4,6,6-$(CH_3)_4$-5-oxo	143
2.64	CHF_2	H	H	F	4,4,6,6-$(CH_3)_4$-5-oxo	183

No.	R^1	R^2	R^3	R^5	$(R^6)_1$	m.p. [°C] or ^{1}H-NMR [ppm]
2.65	Cl	CHF_2	H	F	4,4,6,6-$(CH_3)_4$-5-oxo	173
2.66	F	H	H	F	4,4,6,6-$(CH_3)_4$-5-oxo	153

1) R^4 = 4-Oxo-(bicyclo[3.2.1]oct-2-en-3-yl)carbonyl

Table 3:



Ib

No.	R^1	R^2	R^3	R^5	R^6	m.p. [°C] or ^{1}H-NMR [ppm]
3.1	Cl	H	H	Cl	4,4,6,6-$(CH_3)_4$-5-oxo	156
3.2	CH_3	H	H	1-(1,2,4-triazo-lyl)	4,4,6,6-$(CH_3)_4$-5-oxo	9.00 (d, 1H); 8.09 (s, 1H); 7.82 (d, 1H); 7.72 (s, 1H); 7.68 (d, 1H); 7.47 (d, 1H); 7.35 (q, 1H); 2.95 (s, 3H); 1.55 (s, 6H); 1.30 (s, 6H)
3.3	Cl	H	H	4-morpholinyl	4,4,6,6-$(CH_3)_4$-5-oxo	9.15 (d, 1H); 8.32 (d, 1H); 7.82 (d, 1H); 7.60 (q, 1H); 7.45 (d, 1H); 4.05 (m, 2H); 3.68 (m, 4H); 3.35 (m, 1H); 3.25 (m, 1H); 1.30 (s, 6H); 1.22 (s, 6H)
3.4	Cl	H	H	$SCON(CH_3)_2$	4,4,6,6-$(CH_3)_4$-5-oxo	75
3.5	Cl	H	H	4-oxo-1,4-dihydro-pyrid-1-yl	4,4,6,6-$(CH_3)_4$-5-oxo	9.02 (d, 1H); 8.42 (d, 1H); 7.80 (2d, 3H); 7.50 (q, 1H); 7.38 (d, 1H); 6.72 (d, 2H); 1.50 (s, 12H)
3.6	Cl	H	H	$N(CH_3)_2$	4,4,6,6-$(CH_3)_4$-5-oxo	190

The compounds of the formula I and their agriculturally useful salts are suitable, both in the form of isomer mixtures and in the form of the pure isomers, as herbicides. The herbicidal compositions comprising compounds of the formula I control vegetation on non-crop areas very efficiently, especially at high rates of application. They act against broad-leaved weeds and harmful grasses in crops such as wheat, rice, maize, soya and cotton without causing any significant damage to the crop plants. This effect is mainly observed at low rates of application.

Depending on the application method used, the compounds of the formula I, or the compositions comprising them, can additionally be employed in a further number of crop plants for eliminating undesirable plants. Examples of suitable crops are the following:

Allium cepa, Ananas comosus, Arachis hypogaea, Asparagus officinalis, Beta vulgaris spec. altissima, Beta vulgaris spec. rapa, Brassica napus var. napus, Brassica napus var. napobrassica, Brassica rapa var. silvestris, Camellia sinensis, Carthamus tinctorius, Carya illinoinensis, Citrus limon, Citrus sinensis, Coffea arabica (Coffea canephora, Coffea liberica), Cucumis sativus, Cynodon dactylon, Daucus carota, Elaeis guineensis, Fragaria vesca, Glycine max, Gossypium hirsutum, (Gossypium arboreum, Gossypium herbaceum, Gossypium vitifolium), Helianthus annuus, Hevea brasiliensis, Hordeum vulgare, Humulus lupulus, Ipomoea batatas, Juglans regia, Lens culinaris, Linum usitatissimum, Lycopersicon lycopersicum, Malus spec., Manihot esculenta, Medicago sativa, Musa spec., Nicotiana tabacum (N.rustica), Olea europaea, Oryza sativa, Phaseolus lunatus, Phaseolus vulgaris, Picea abies, Pinus spec., Pisum sativum, Prunus avium, Prunus persica, Pyrus communis, Ribes sylvestre, Ricinus communis, Saccharum officinarum, Secale cereale, Solanum tuberosum, Sorghum bicolor (s. vulgare), Theobroma cacao, Trifolium pratense, Triticum aestivum, Triticum durum, Vicia faba, Vitis vinifera and Zea mays.

In addition, the compounds of the formula I may also be used in crops which tolerate the action of herbicides owing to breeding, including genetic engineering methods.

The compounds of the formula I, or the herbicidal compositions comprising them, can be used for example in the form of ready-to-spray aqueous solutions, powders, suspensions, also highly-concentrated aqueous, oily or other suspensions or dispersions, emulsions, oil dispersions, pastes, dusts, materials for broadcasting or granules, by means of spraying, atomizing,

dusting, broadcasting or watering. The use forms depend on the intended aims; in any case, they should guarantee a very fine distribution of the active compounds according to the invention.

The herbicidal compositions comprise a herbicidally effective amount of at least one compound of the formula I or of an agriculturally useful salt of I, and auxiliaries which are customary for the formulation of crop protection agents.

Essentially, suitable inert auxiliaries include:
mineral oil fractions of medium to high boiling point, such as kerosene and diesel oil, furthermore coal tar oils and oils of vegetable or animal origin, aliphatic, cyclic and aromatic hydrocarbons, e.g. paraffin, tetrahydronaphthalene, alkylated naphthalenes and their derivatives, alkylated benzenes and their derivatives, alcohols such as methanol, ethanol, propanol, butanol and cyclohexanol, ketones such as cyclohexanone, or strongly polar solvents, e.g. amines such as N-methylpyrrolidone, and water.

Aqueous use forms can be prepared from emulsion concentrates, suspensions, pastes, wettable powders or water-dispersible granules by adding water. To prepare emulsions, pastes or oil dispersions, the cyclohexenonequinolinoyl derivatives of the formula I, either as such or dissolved in an oil or solvent, can be homogenized in water by means of a wetting agent, tackifier, dispersant or emulsifier. Alternatively, it is possible to prepare concentrates comprising active substance, wetting agent, tackifier, dispersant or emulsifier and, if desired, solvent or oil, which are suitable for dilution with water.

Suitable surfactants are the alkali metal salts, alkaline earth metal salts and ammonium salts of aromatic sulfonic acids, e.g. ligno-, phenol-, naphthalene- and dibutylnaphthalenesulfonic acid, and of fatty acids, alkyl- and alkylarylsulfonates, alkyl sulfates, lauryl ether sulfates and fatty alcohol sulfates, and salts of sulfated hexa-, hepta- and octadecanols, and also of fatty alcohol glycol ethers, condensates of sulfonated naphthalene and its derivatives with formaldehyde, condensates of naphthalene, or of the naphthalenesulfonic acids with phenol and formaldehyde, polyoxyethylene octylphenol ether, ethoxylated isooctyl-, octyl- or nonylphenol, alkylphenyl or tributylphenyl polyglycol ether, alkylaryl polyether alcohols, isotridecyl alcohol, fatty alcohol/ethylene oxide condensates, ethoxylated castor oil, polyoxyethylene alkyl ethers or polyoxypropylene alkyl ethers, lauryl alcohol polyglycol ether acetate, sorbitol esters, lignin-sulfite waste liquors or methylcellulose.

Powders, materials for broadcasting and dusts can be prepared by mixing or grinding the active substances together with a solid carrier.

Granules, e.g. coated granules, impregnated granules and homogeneous granules, can be prepared by binding the active compounds to solid carriers. Solid carriers are mineral earths, such as silicas, silica gels, silicates, talc, kaolin, limestone, lime, chalk, bole, loess, clay, dolomite, diatomaceous earth, calcium sulfate, magnesium sulfate, magnesium oxide, ground synthetic materials, fertilizers such as ammonium sulfate, ammonium phosphate and ammonium nitrate, ureas, and products of vegetable origin, such as cereal meal, tree bark meal, wood meal and nutshell meal, cellulose powders, or other solid carriers.

The concentrations of the compounds of the formula I in the ready-to-use preparations can be varied within wide ranges. In general, the formulations comprise from about 0.001 to 98% by weight, preferably 0.01 to 95% by weight of at least one active compound. The active compounds are employed in a purity of from 90% to 100%, preferably 95% to 100% (according to the NMR spectrum).

The following formulation examples illustrate the production of such preparations:

I. 20 parts by weight of the compound No. 2.2 are dissolved in a mixture composed of 80 parts by weight of alkylated benzene, 10 parts by weight of the adduct of 8 to 10 mol of ethylene oxide to 1 mol of oleic acid N-monoethanolamide, 5 parts by weight of calcium dodecylbenzenesulfonate and 5 parts by weight of the adduct of 40 mol of ethylene oxide to 1 mol of castor oil. Pouring the solution into 100,000 parts by weight of water and finely distributing it therein gives an aqueous dispersion which comprises 0.02% by weight of the active compound.

II. 20 parts by weight of the compound No. 2.4 are dissolved in a mixture composed of 40 parts by weight of cyclohexanone, 30 parts by weight of isobutanol, 20 parts by weight of the adduct of 7 mol of ethylene oxide to 1 mol of isooctylphenol and 10 parts by weight of the adduct of 40 mol of ethylene oxide to 1 mol of castor oil. Pouring the solution into 100,000 parts by weight of water and finely distributing it therein gives an aqueous dispersion which comprises 0.02% by weight of the active compound.

III. 20 parts by weight of the compound No. 2.16 are dissolved in a mixture composed of 25 parts by weight of cyclohexanone, 65 parts by weight of a mineral oil fraction of boiling point 210 to 280°C and 10 parts by weight of the adduct of 40 mol of ethylene oxide to 1 mol of castor oil. Pouring the solution into 100,000 parts by weight of water and finely distributing it therein gives an aqueous dispersion which comprises 0.02% by weight of the active compound.

IV. 20 parts by weight of the compound No. 2.18 are mixed thoroughly with 3 parts by weight of sodium diisobutylnaphthalenesulfonate, 17 parts by weight of the sodium salt of a lignosulfonic acid from a sulfite waste liquor and 60 parts by weight of pulverulent silica gel, and the mixture is ground in a hammer mill. Finely distributing the mixture in 20,000 parts by weight of water gives a spray mixture which comprises 0.1% by weight of the active compound.

V. 3 parts by weight of the compound No. 2.22 are mixed with 97 parts by weight of finely divided kaolin. This gives a dust which comprises 3% by weight of the active compound.

VI. 20 parts by weight of the compound No. 2.46 are mixed intimately with 2 parts by weight of the calcium salt of dodecylbenzenesulfonate, 8 parts by weight of fatty alcohol polyglycol ether, 2 parts by weight of the sodium salt of a phenol/urea/formaldehyde condensate and 68 parts by weight of a paraffinic mineral oil. This gives a stable oily dispersion.

VII. 1 part by weight of the compound No. 3.1 is dissolved in a mixture composed of 70 parts by weight of cyclohexanone, 20 parts by weight of ethoxylated isooctylphenol and 10 parts by weight of ethoxylated castor oil. This gives a stable emulsion concentrate.

VIII. 1 part by weight of the compound No. 3.4 is dissolved in a mixture composed of 80 parts by weight of cyclohexanone and 20 parts by weight of Wettol® EM 31 (nonionic emulsifier based on ethoxylated castor oil). This gives a stable emulsion concentrate.

The compounds of the formula I or the herbicidal compositions can be applied pre- or post-emergence. If the active compounds are less well tolerated by certain crop plants, application

techniques may be used in which the herbicidal compositions are sprayed, with the aid of the spraying equipment, in such a way that they come into contact as little as possible, if at all, with the leaves of the sensitive crop plants, while the active compounds reach the leaves of undesirable plants growing underneath, or the bare soil surface (post-directed, lay-by).

The application rates of the compound of the formula I are from 0.001 to 3.0, preferably 0.01 to 1.0 kg/ha of active substance (a.s.), depending on the control target, the season, the target plants and the growth stage.

To widen the activity spectrum and to achieve synergistic effects, the cyclohexenonequinolinoyl derivatives of the formula I may be mixed with a large number of representatives of other herbicidal or growth-regulating active compound groups and then applied concomitantly. Suitable components for mixtures are, for example, 1,2,4-thiadiazoles, 1,3,4-thiadiazoles, amides, aminophosphoric acid and its derivatives, aminotriazoles, anilides, (het)aryloxyalkanoic acids and their derivatives, benzoic acid and its derivatives, benzothiadiazinones, 2-aroyl-1,3-cyclohexanediones, hetaryl aryl ketones, benzylisoxazolidinones, meta-CF_3-phenyl derivatives, carbamates, quinolinecarboxylic acid and its derivatives, chloroacetanilides, cyclohexenone oxime ether derivatives, diazines, dichloropropionic acid and its derivatives, dihydrobenzofurans, dihydrofuran- 3-ones, dinitroanilines, dinitrophenols, diphenyl ethers, dipyridyls, halocarboxylic acids and their derivatives, ureas, 3-phenyluracils, imidazoles, imidazolinones, N-phenyl-3,4,5,6-tetrahydrophthalimides, oxadiazoles, oxiranes, phenols, aryloxy- and hetaryloxyphenoxypropionic esters, phenylacetic acid and its derivatives, phenylpropionic acid and its derivatives, pyrazoles, phenylpyrazoles, pyridazines, pyridinecarboxylic acid and its derivatives, pyrimidyl ethers, sulfonamides, sulfonylureas, triazines, triazinones, triazolinones, triazolecarboxamides and uracils.

It may furthermore be advantageous to apply the compounds of the formula I, alone or else concomitantly in combination with other herbicides, in the form of a mixture with other crop protection agents, for example together with agents for controlling pests or phytopathogenic fungi or bacteria. Also of interest is the miscibility with mineral salt solutions, which are employed for treating nutritional and trace element deficiencies. Non-phytotoxic oils and oil concentrates may also be added.

Use Examples

The herbicidal activity of the cyclohexenonequinolinoyl derivatives of the formula I was demonstrated by the following greenhouse experiments:

The culture containers used were plastic pots containing loamy sand with approximately 3.0% of humus as the substrate. The seeds of the test plants were sown separately for each species.

For the pre-emergence treatment, the active compounds, which had been suspended or emulsified in water, were applied directly after sowing by means of finely distributing nozzles. The containers were irrigated gently to promote germination and growth and subsequently covered with transparent plastic hoods until the plants had rooted. This cover caused uniform germination of the test plants, unless this was adversely affected by the active compounds.

For the post-emergence treatment, the test plants were first grown to a height of 3 to 15 cm, depending on the plant habit, and only then treated with the active compounds which had been suspended or emulsified in water. The test plants were for this purpose either sown directly and grown in the same containers, or they were first grown separately as seedlings and transplanted into the test containers a few days prior to treatment. The application rate for the post-emergence treatment was 0.25 or 0.125 kg of a.s. (active substance)/ha.

Depending on the species, the plants were kept at 10 - 25°C or 20 - 35°C. The test period extended over 2 to 4 weeks. During this time, the plants were tended, and their response to the individual treatments was evaluated.

The evaluation was carried out using a scale from 0 to 100. 100 means no emergence of the plants, or complete destruction of at least the aerial parts and 0 means no damage, or normal course of growth.

The plants used in the greenhouse experiments are composed of the following species:

Scientific Name	Common Name
Abutilon theophrasti	velvet leaf
Chenopodium album	lambsquarters
Galium aparine	catchweed bedstraw
Ipomoea spp.	morning glory
Setaria faberi	giant foxtail
Setaria viridis	green foxtail
Solanum nigrum	black nightshade

At application rates of 0.25 and 0.125 kg of a.s./ha, the compounds 2.2, 2.4 and 2.16, applied post-emergence, showed very good activity against harmful plants such as giant foxtail, green foxtail and black nightshade. Furthermore, the compounds 2.2 and 2.4 controlled velvet leaf and morning glory very efficiently. Compound 2.16 additionally showed excellent activity against the weeds lambsquarters and catchweed bedstraw.